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DECEMBER, 1947

A BILL BROTHERS PUBLICATION

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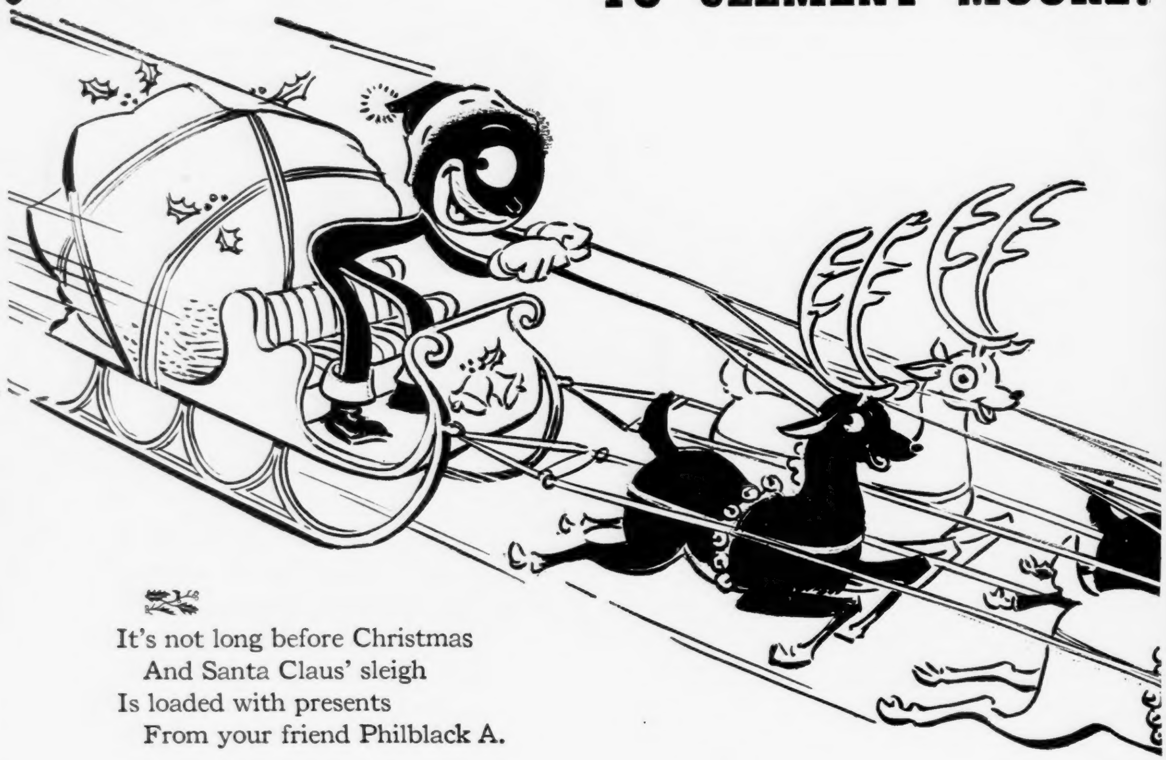
Photo courtesy Brown Citrus Fruit Machinery Co. *Juice cups molded by Kirkhill Rubber Co.*

With Apologies TO CLEMENT MOORE!



It's not long before Christmas
And Santa Claus' sleigh
Is loaded with presents
From your friend Philblack A.

For makers of tires, there's
"Resistance to cracks."
"Low heat build-up" too,
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For "low hysteresis"
"Easy processing," too,
Just use Philblack A . . .
That's all you need do!

For "tubing and splicing"
"Extrusions so smooth"
If you use Philblack A
You'll be in the groove!

And we heard Philblack say
As he drove out of sight
"Write a letter to Santa
Ask for *Philblack, tonight!*"

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Philblack Division

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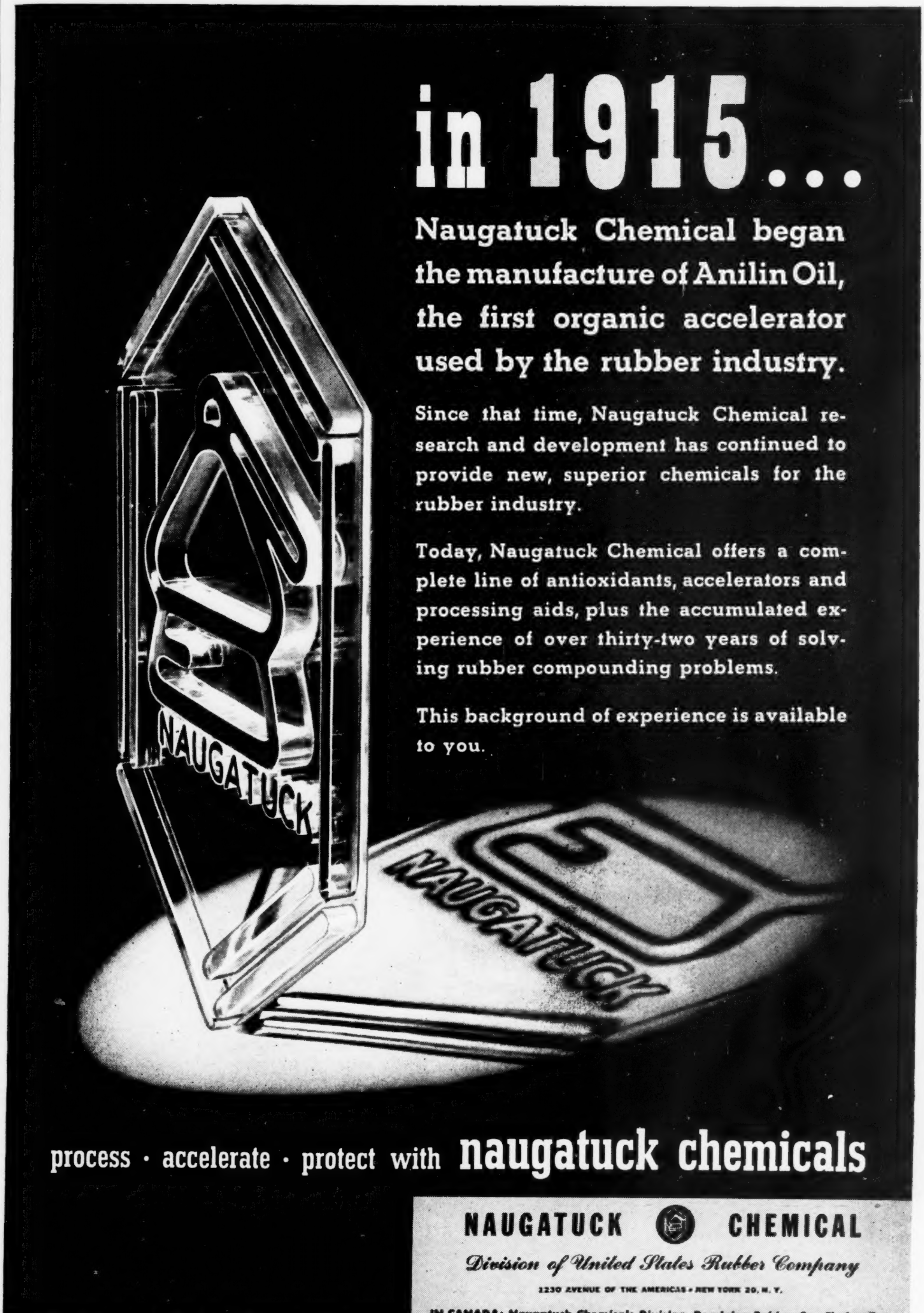
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TESTS SHOW HOW CLOGGED STRAINER SCREENS CHOKE OUTPUT, BOOST HP RATINGS

TAKE a look at the chart at the right. It's a composite of a series of production tests on inner tube stock made on a 10" rubber strainer at the plant of a well-known tire manufacturer.

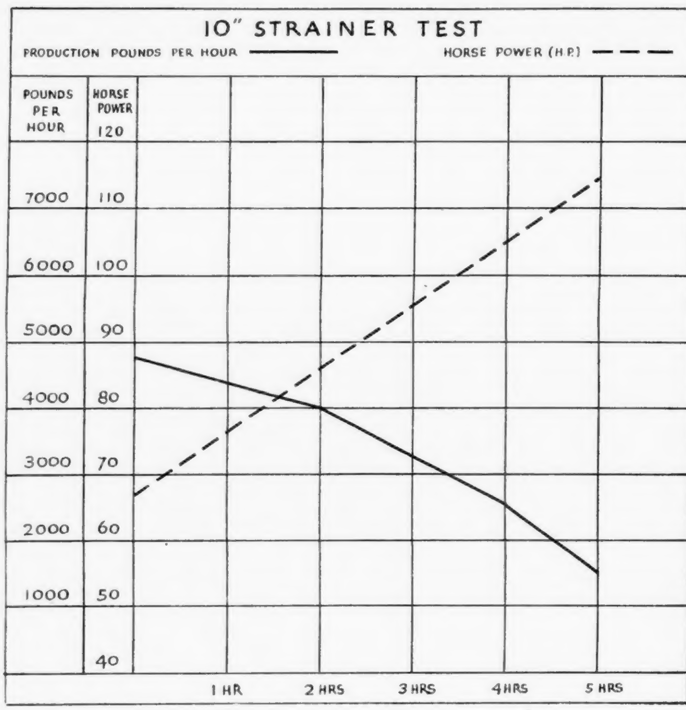
It shows, more clearly than we could ever tell you, how dirty strainer screens reduce output and raise power consumption.

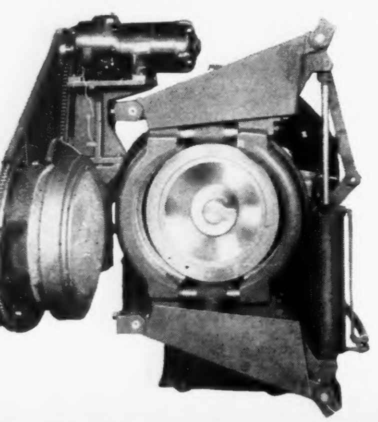
The solid line represents production in pounds per hour; the broken line is horsepower rating.

With clean screens, at the start of the run, note that output is at the rate of approximately 4800 lbs. per hour with about 67 HP required. Then note how at the end of 5 hours, production has been cut to only 1500 lbs., while power consumption has soared to about 115 HP.

Screens must be changed, and changed often, if production is to be kept on an efficient basis. And the key to *frequent* screen changes is *ease* in which they can be changed.

Screen changes that take from five to ten minutes and more with old type strainer heads can now be made in less than a minute.





With the new clamp-type, quick opening NRM strainer head you can convert your present strainer equipment to this great time-saving feature, *and make other savings too.*

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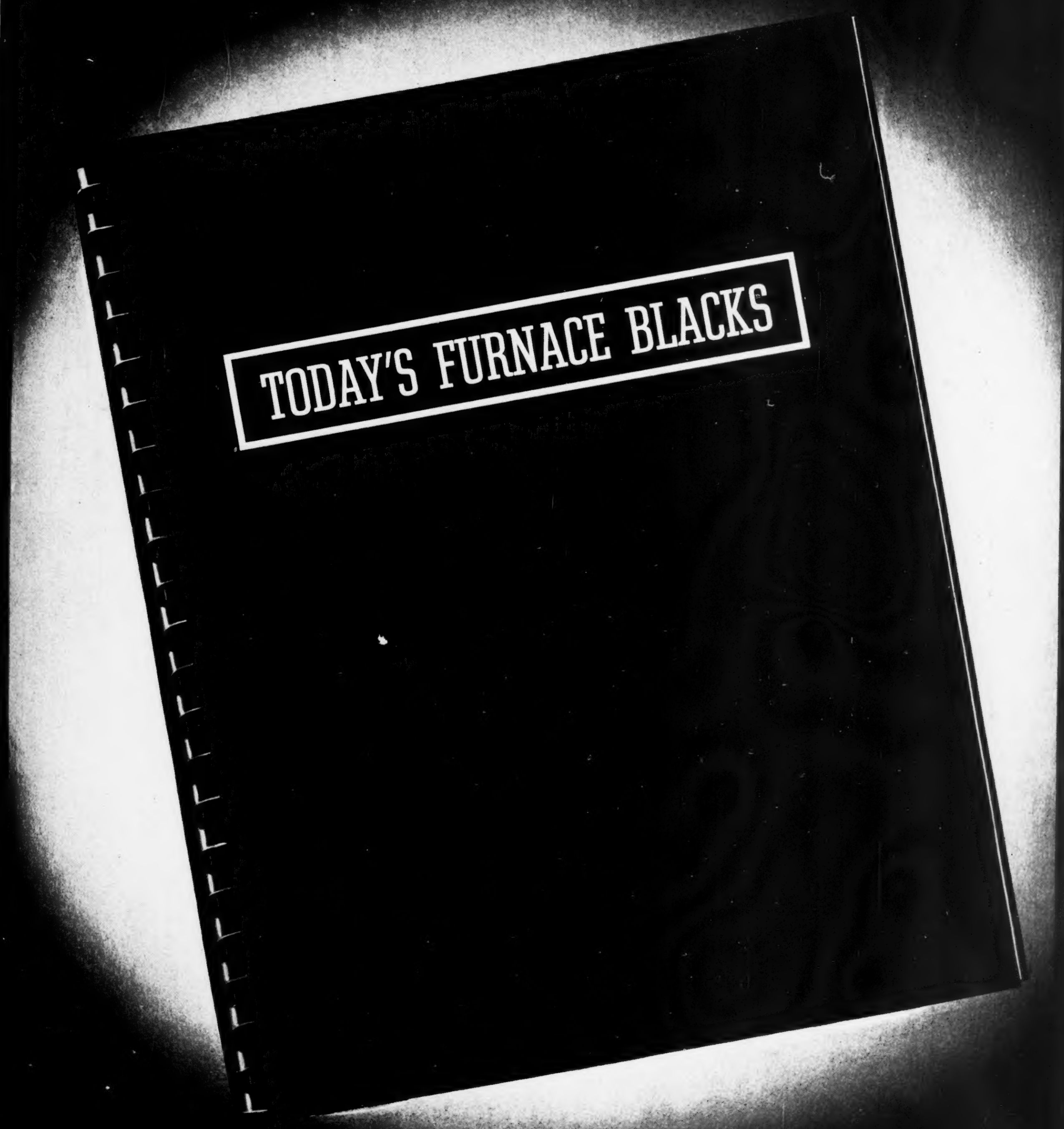

TODAY'S FURNACE BLACKS

Technical Bulletin No. 39

on the Compounding of GR-S with Substantial Loadings of ZINC OXIDE

GR-S-16 with 100 Parts of Zinc Oxide
Effect of Sulfur Variation

(Refer to Technical Bulletins Nos. 28 and 29)

The interest developed in X-272 has resulted in its being made a special purpose polymer designated as GR-S-16. It is defined by *Rubber Reserve* as follows: *Mooney ML-4-212° F., 95-105; Soap Emulsifier, Rosin Acid; Stabilizer, Stalite; Coagulation, Glue-Acid; Approximate Monomer Charge Ratio, 71/29 Butadiene/Styrene.*

COMPOUND NO. 39

GR-S-16	100.0
Sulfur	Variable
MBTS	0.79
Santocure	0.33
Coumarone-indene Resin	3.0
E.L.C. Magnesia	5.0
ZINC OXIDE	100.0

ORIGINAL RESULTS

Time of Cure Min. at 45 Lb.	Tensile Strength (psi)	Per Cent Elongation	Modulus Load (psi) for Elongation of: 200%	300%	400%	500%	Permanent Set	Shore Hardness	Tear Resistance Tested at Room Temp.	100°C.
1.19 PARTS SULFUR										
7.5	40	1190	40	40	40	40	1.60	38	27	11
15	1310	965	80	120	200	275	.33	43	178	61
30	1960	770	200	280	400	600	.19	49	99	52
45	1940	735	240	355	515	750	.19	50	97	52
60	2060	750	200	275	395	595	.18	50	95	50
90	1940	770	160	240	355	515	.18	50	95	50
2.00 PARTS SULFUR										
7.5	75	1140	40	40	40	75	1.36	40	50	20
15	1665	785	160	200	315	515	.20	45	87	51
30	1820	695	240	355	515	830	.18	50	82	41
45	1680	625	240	400	600	960	.14	52	84	48
60	1570	610	235	350	550	900	.15	52	92	47
90	1920	670	245	325	530	900	.16	52	82	48

Time of Cure Min. at 45 Lb.	Goodyear-Healey Pendulum: Indentation in mm.	Per Cent Rebound	Hardness: Shore	Rex	Compression Fatigue (Goodrich Flexometer)*: Per Cent Initial Comp.	Running Time and Per Cent Permanent Set	Max. Temp. Rise °C.	Dynamic Compression: Initial	Final	Cut-Growth Resistance Tested at 70° C. Inches Failure 10,000 Cycles
1.19 PARTS SULFUR										
60	7.30	49.5	50	55	35.0	B.O. – 20′	106.5 + (At 5′–45.6)	25.1	45.2	.77
2.00 PARTS SULFUR										
60	7.15	50.0	53	56	31.4	53′ – 34.0	87.4 (At 5′–33.2)	19.7	39.9	.67

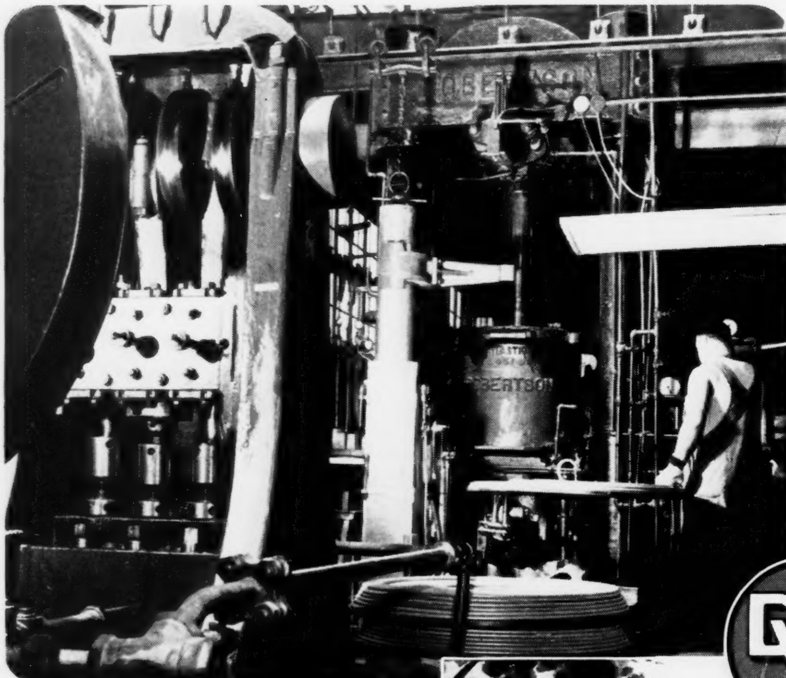
*Test Conditions: 143 Lb. Load. 0.175″ Stroke. 100° C. Oven Temp.

THE MBTS—Santocure acceleration follows German carcass stock practice previously referred to in *Technical Bulletin No. 22.* Reversion was noted in this compound and is also evident in the present tests.

The effect of sulfur content in Zinc Oxide compounds on tensile strength and tear resistance is quite striking as has been noted previously. The increased sulfur content produces only a small increase in pendulum rebound but under the severe operating conditions of the Goodrich Flexometer, the higher sulfur compound showed lower temperature rise. The cut-growth resistance of these compounds is excellent.

With this acceleration, GR-S-16 does not develop the high modulus values noted for X-272 with "El-Sixty-DPG" acceleration (Technical Bulletin No. 28) and for other high Mooney polymers.

A Familiar Name...

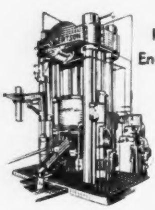


IN *another* WELL KNOWN PLANT

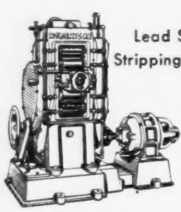
A Robertson Hose Lead Encasing Press, installed at the DeVilbiss hose plant, lead encases hose under 2100 tons pressure preliminary to the vulcanizing operation. Also, in the left foreground, is a Robertson High Pressure Hydraulic Pump.

Photographs used through courtesy of The DeVilbiss Company.

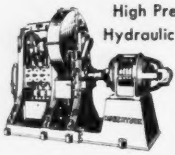
Exterior view of the DeVilbiss hose plant.



Hose Lead Encasing Press



Lead Sheath Stripping Machine



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Leading firms, among them DeVilbiss, have long been users of Robertson "custom built" high pressure hydraulic equipment. Our more than 89 years of experience in the design and manufacture of this type of machinery *only*, plus painstaking craftsmanship, substantiates the saying — "If it's a Robertson, it's right."

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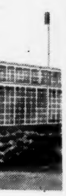

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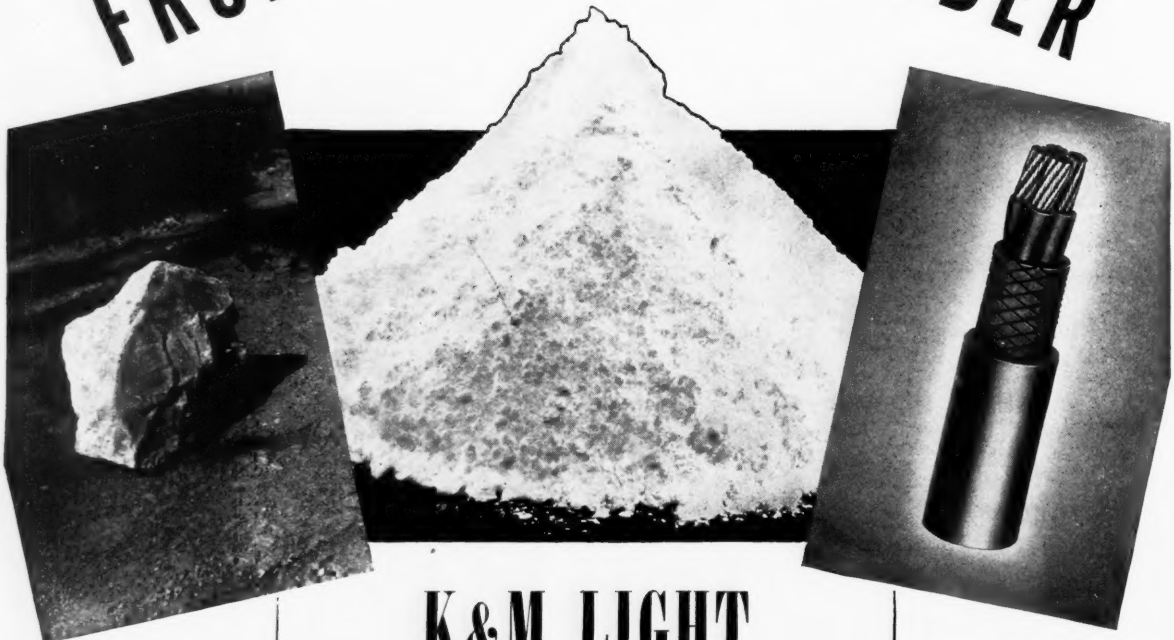
FROM ROCK TO RUBBER



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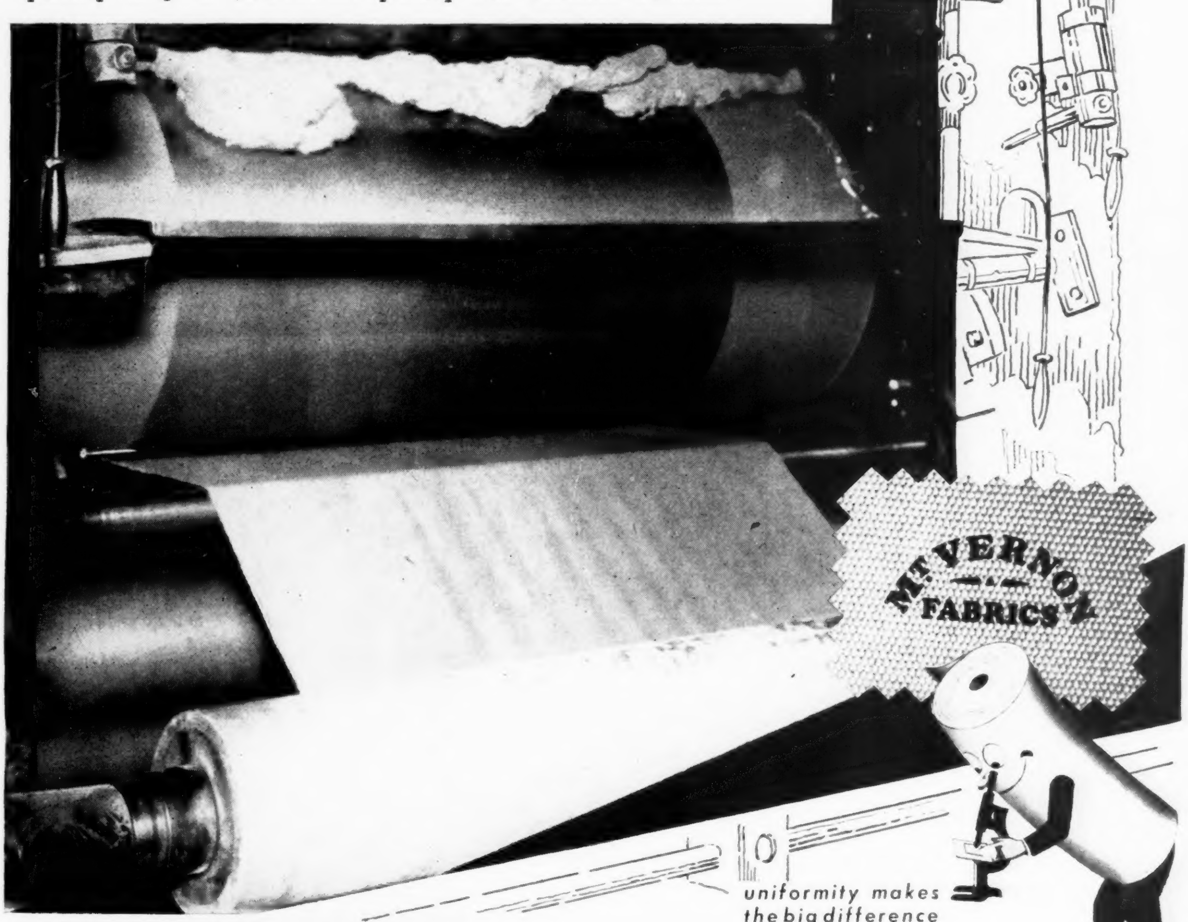

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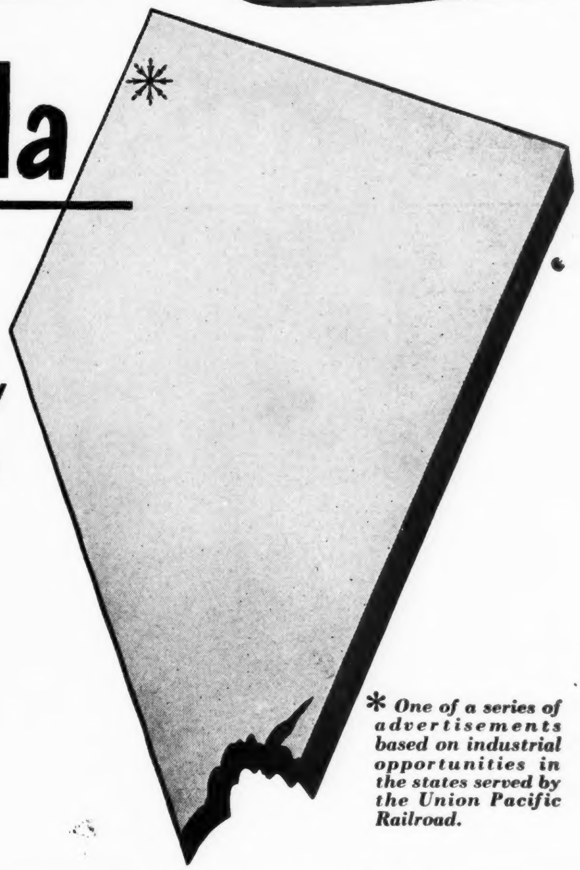
UNION PACIFIC TREASURE MAP OF INDUSTRY

Nevada



- **_Variety of metals, minerals and ores of value to industry_**
- **_Power and irrigation projects_**
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* ***One of a series of advertisements based on industrial opportunities in the states served by the Union Pacific Railroad.***

Manufacturers, packers and processors will find Nevada a storehouse of raw materials. There are deposits of copper, silver, gold, zinc, lead and uranium. Mineral ores and minerals include tungsten, manganese and antimony ore, magnesite, gypsum, sulphur, borax and vanadium. Building stone and marble also are available.

Cattle, sheep and poultry raising are expanding agricultural pursuits and there also is some production of a variety of grains, vegetables and fruits.

Irrigation and power are supplied by several Federal projects including famous Hoover Dam.

Nevada's healthful climate, excellent educational system, and a variety of scenic attractions contribute to the advantages of living in this western area.

Each year, thousands of vacationists visit gigantic Hoover Dam, beautiful Lake Mead and near-by picturesque Las Vegas.

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THE STRATEGIC MIDDLE ROUTE

A telephone listens to a loud speaker in the new "free field" acoustic test room at Bell Telephone Laboratories. The sound-transparent "floor" is built of steel cables.

Test-tube for Sound

This giant "test-tube" is actually an echoless sound room at Bell Telephone Laboratories. Here engineers seek new facts about sound which will help them make telephone service still better and more dependable.

Bell scientists know a great deal about what happens to sound in electrical systems. This new room will give them a powerful tool to find out more about what happens to sound in the air.

In an ordinary living room, most of the sound addressed to you comes by way of reflections. At 10 feet less than 10% reaches you directly.

Sound that *bounces* at you from walls, ceilings, furniture, and your body is all right for hearing—but it poses questions for scientists who would study it uncontaminated by reflections.

The Bell Laboratories "test-tube" gives telephone people the chance to produce pure sound and analyze it reliably with respect to intensity, pitch, and direction. The entire room is lined with glass wool, contained in wire-mesh cases, wedge-shaped to give maximum absorbing area. Sound bounces along the sloping surfaces, sifts into the soft glass wool, and is gradually stifled.

This is one more example of Bell Laboratories' constant work to learn more about everything which can extend and improve telephone service.

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Exploring and inventing, devising and perfecting for continued improvements and economies in telephone service.

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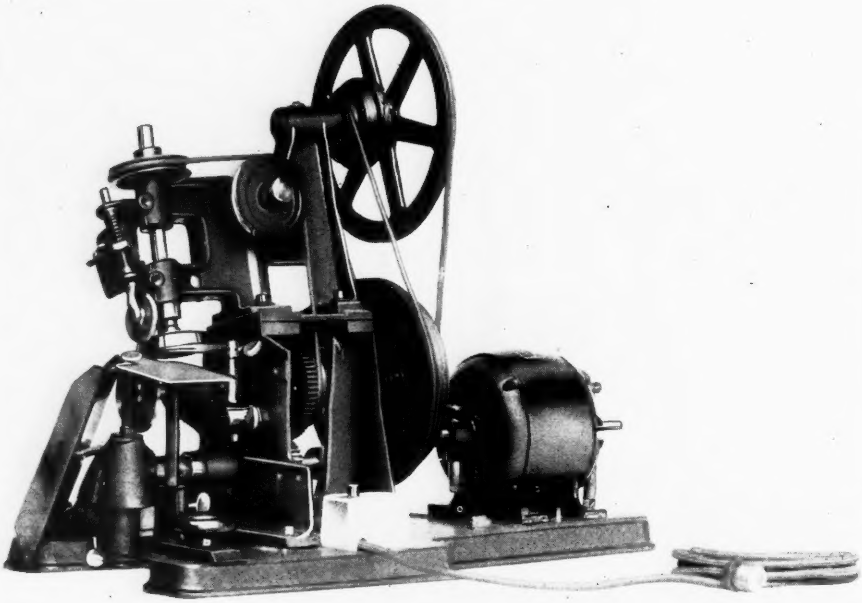

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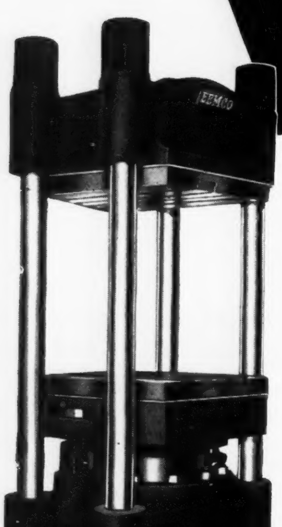

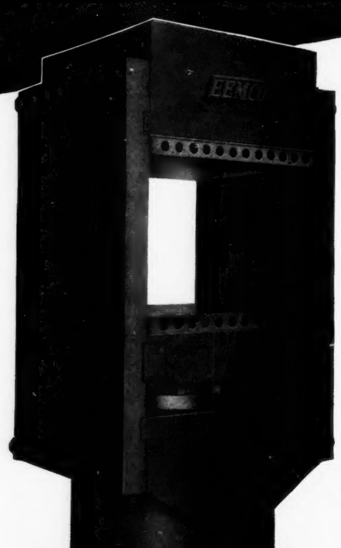

announcing:

THE NEW FARREL-BIRMINGHAM Z TY

Engineered to enhance accuracy, uniformity, quality and operating control . . . .

This *first* Z-type, four-roll calender represents the most significant advance in calender design since Farrel-Birmingham first built calenders for the rubber industry in 1854.

Here is a brief summary of its outstanding features:

1. THE "Z" ARRANGEMENT OF THE ROLLS offers a number of advantages in the production of film to accurate, uniform gauge.
2. HYDRAULIC PRELOADING DEVICES anchor the rolls in their fixed, loaded positions, in bearings of the improved, precision sleeve type.
3. DRIVE AND CONNECTING GEARS are eliminated from the calender itself. The gears are enclosed in a separate fabricated steel housing and are coupled to the rolls with smooth-operating universal spindles.
4. ROLLS are chamber-bored and drilled under the working surface for the most effective temperature control. Means for varying the crown can be built in if desired.

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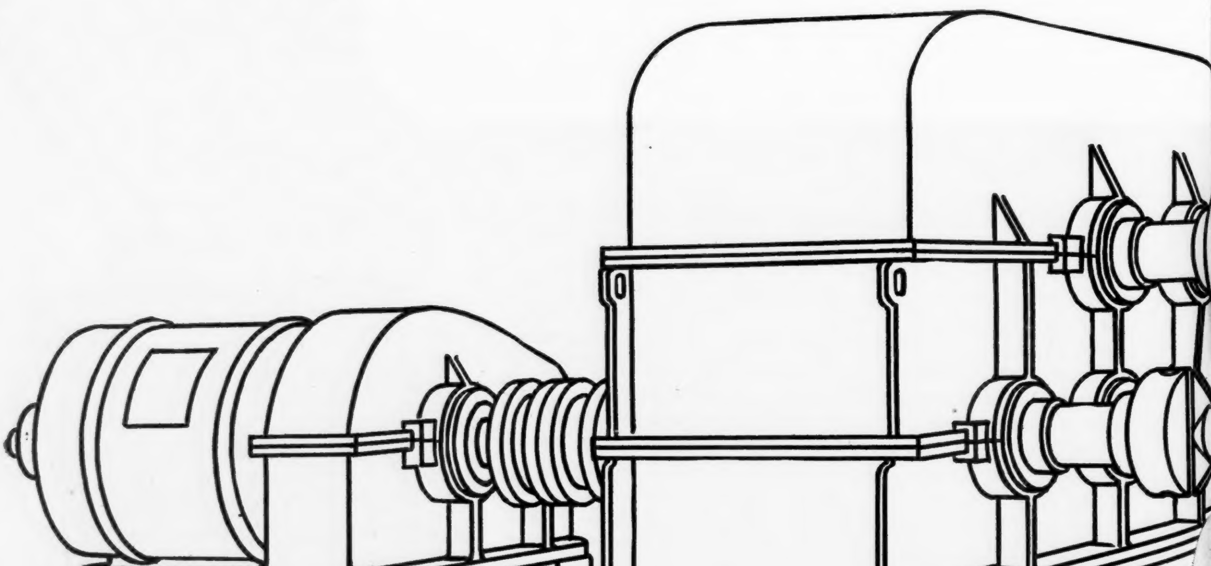

Farrel

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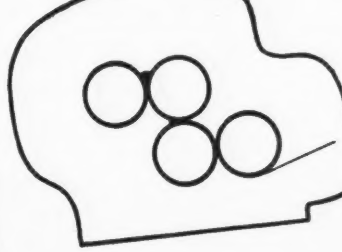

Arrangement of rolls in the new Farrel - Birmingham Z-type film calender

5 ROLL JOURNALS are flood-lubricated and have improved oil seals to safeguard against oil leakage.

This is another example of the type of engineering that has made Farrel-Birmingham the leader in producing processing equipment for the rubber and plastics industries.

FB-369

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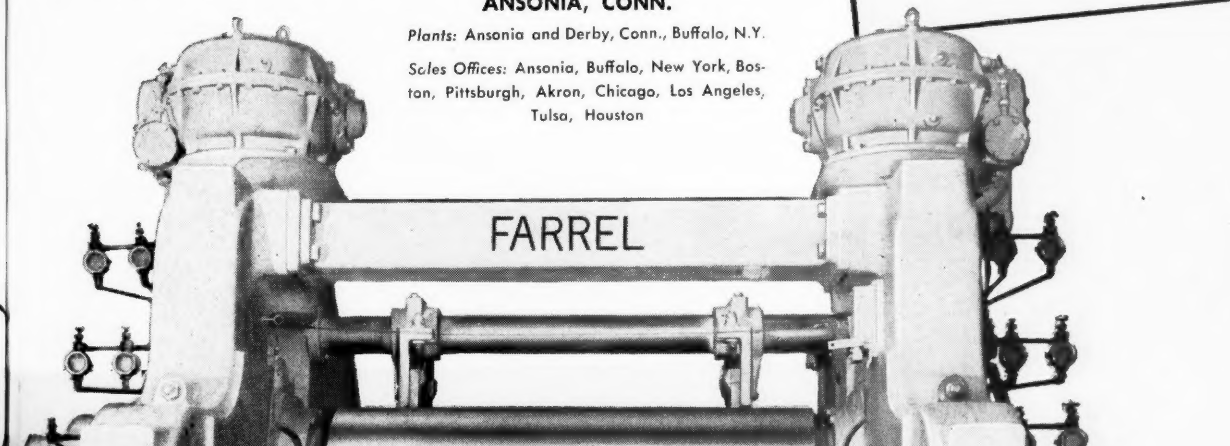

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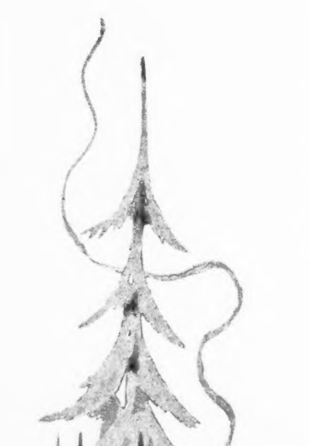
PATENTS APPLIED FOR



December, 1947

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INDIA

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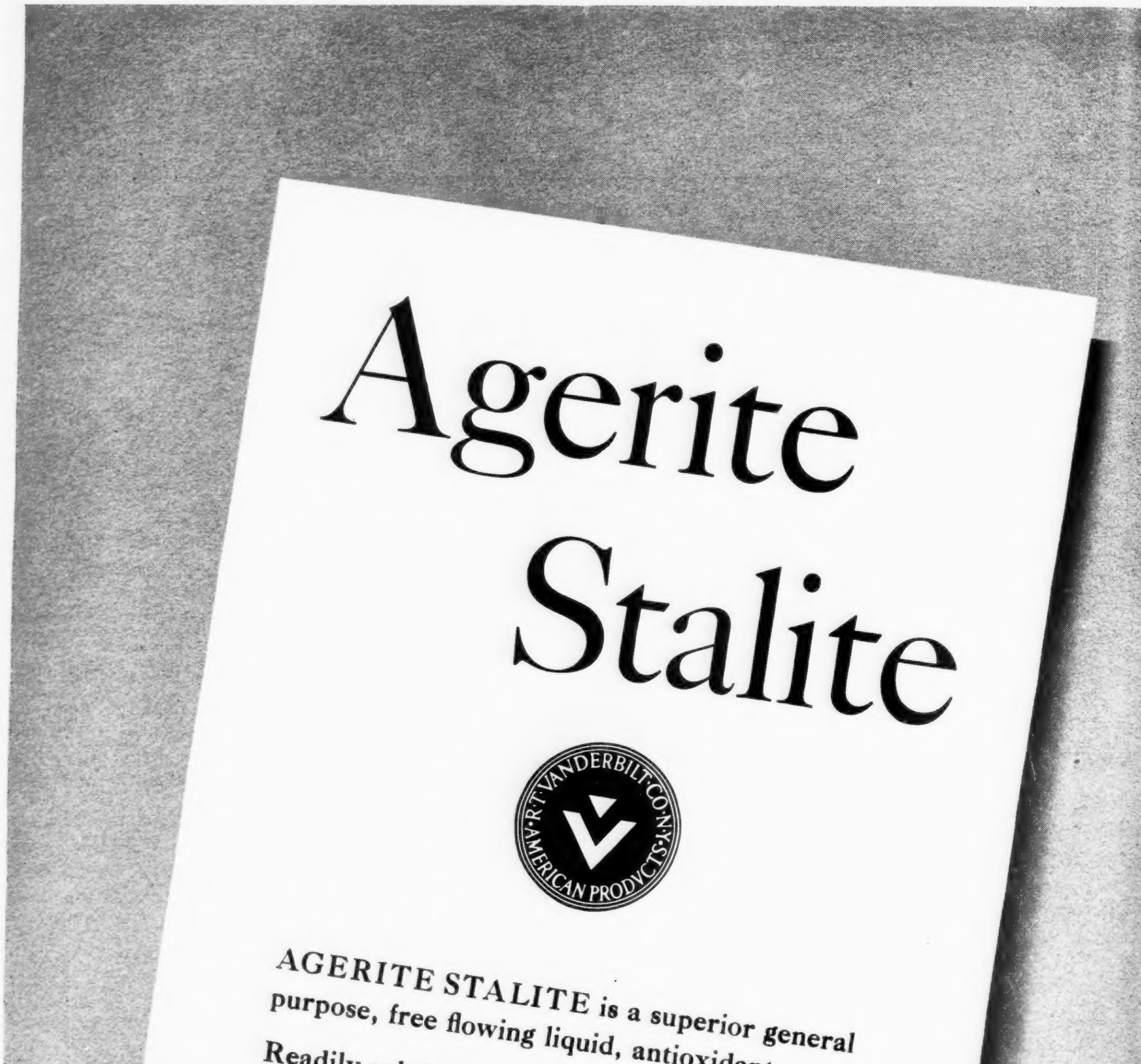
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INDIA
RUBBER WORLD

Volume 117 New York, December, 1947 Number 3

The Mechanism of Reinforcement of Elastomers by Pigments[1]

Leonard H. Cohan[2]

THE term *reinforcement* has, unfortunately, been rather loosely used in the rubber literature. Most authors have employed it to denote improvement in service life, particularly of rubber articles subject to abrasive wear. Generally speaking, reinforcement is associated with high tensile strength, modulus, and resistance to tear, and low resilience and plasticity in the unvulcanized state. When we examine these properties, we see that we are not dealing with a single phenomenon which can be termed reinforcement, but with several classes of properties, each of which depends in a different way on the fundamental characteristics of the pigment used to reinforce the elastomer and on the loading.

Two important classes of properties will be considered in this paper. The first, or modulus, class includes modulus, hardness, and plasticity. These properties may be thought of as related to the flow or viscosity of the uncured or cured elastomer. The second, or tensile, class includes tensile strength, tensile product, and tear resistance. Attempts have already been made to predict behavior of the modulus class, particularly at low pigment loadings (1, 2).[3] In this paper we shall apply these ideas to commercial loadings and point out some relations between pigmentation and the tensile class of properties.

Modulus, Hardness, Plasticity

The properties of pigments which appear to be most important in determining the behavior of elastomers are: (1) particle size distribution, (2) particle shape, (3) chemical nature of the particle surface, and (4) crystal or chemical structure of the particles. For symmetrical particles, particle size distribution determines specific surface area; for asymmetrical particles, particle shape also affects surface area.

Considering a loaded elastomer as a uniform elastic matrix containing inelastic particles, Rehner (3), Smallwood (1), and Guth and Gold (4) have shown that the calculation of modulus is entirely analagous to the calculation of the viscosity of a suspension of solid particles in a liquid. For symmetrical particles in a suspension sufficiently dilute so that the particles do not interfere with each other, equation 1, derived by Einstein (5), gives the dependence of viscosity, η, on V, the ratio of the volume of solid particles to the total volume of the suspension. η_0 is the viscosity of the liquid medium.

$$1.\ \eta = \eta_0 (1 + 2.5\,V)$$
$$2.\ \eta = \eta_0 (1 + 2.5\,V + 14.1\,V^2)$$
$$3.\ M = M_0 (1 + 2.5\,V + 14.1\,V^2)$$
$$4.\ M = M_0 (1 + 0.67\,fV + 1.62\,f^2V^2)$$

Equation 2 is the extension of the Einstein equation derived by Guth and Gold (4) for somewhat higher concentrations where pairs of particles may interact. Equation 3 is the completely analagous equation for the modulus, M, of an elastomer containing symmetrical pigment particles. M_0 is the modulus of the unpigmented matrix, which is closely approximated by the modulus of the corresponding gum stock. Equation 4 gives the modulus when the particles are long, narrow rods (2). The shape factor, f, is equal to the ratio of the length of the rods to their diameter.

The above equations were derived for Young's modulus. They should, however, hold also for modulus at a given elongation as ordinarily measured, provided the stress-strain curves are such that the ratio of the modulus at one loading to that at another is the same at all elongations up to the one at which modulus is measured; that is, the curves belong to a single parameter family. This condition appears to hold for most of the stocks included in this paper.

Examination of the equations reveals that modulus depends on the volume loading and the shape of the pigment particles and should be independent of the other three important fundamental properties of pigments except insofar as these properties influence either effective volume loading or effective shape factor. For example, if the nature of the surface is such that the elastic medium is bound and rendered inelastic at the pigment surface, and if the particle size is small enough so that a large area per unit volume of pigment is available for binding elastomer, then the effective volume of inelastic dispersed phase may be appreciably increased. Likewise, if the surface nature and crystal structure are such that

[1] Presented at the Pacific Industrial Conferences of the California Section, A. C. S., San Francisco, Calif., Oct. 24, 1947. This paper was part of the program arranged by Northern California and Los Angeles Rubber groups.
[2] Director, Witco Chemical Co. technical service laboratory, and director of research, Continental Carbon Co.
[3] Bibliography references appear at end of article.

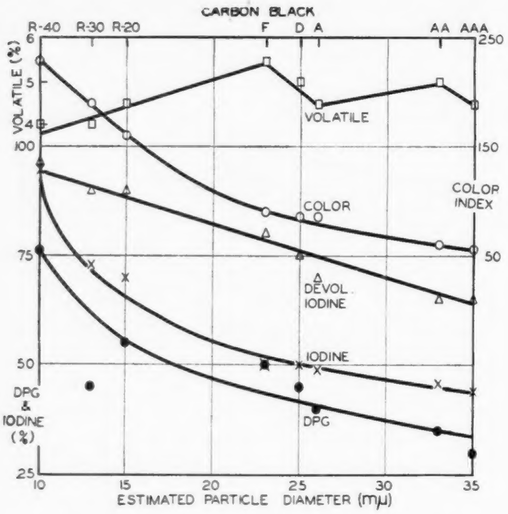

Fig. 1. Physical Properties of Channel Blacks

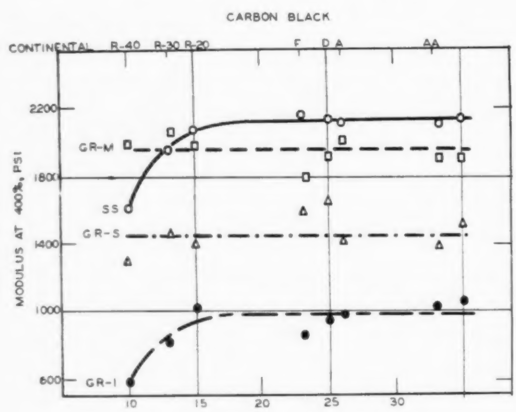

Fig. 2. Modulus of Channel Black Stocks

adhesive forces cause the particles to agglomerate into stable, irregular aggregates, then the effective shape factor may be changed. In applying these equations to commercial loadings we should be alert not only to possibilities such as the foregoing, but also to the fact that the equations were derived under the assumption that the individual particles are separated sufficiently so that extensive interaction between particles does not occur. Departure from the theoretical equation may be appreciable where the particles are irregular and may interlock with each other at high concentrations. Such interlocking would lead to a progressive increase in shape factor as the loading is increased.

Effect of Particle Diameter

Inasmuch as carbon blacks may vary considerably in the shape of their rather stable secondary aggregates, one must be careful in selecting a series of blacks of varying size that the shape factor does not change. The blacks in Figure 1 are all channel blacks prepared by very similar methods, and it is felt that in this case differences in the shape factor of the aggregates are negligible. The average particle diameter was estimated from electronmicrographs and from specific surface measurements on similar channel blacks; however the linear relation between average diameter and iodine adsorption on the devolafilized black is an indication that the estimated diameters are approximately correct. Continental AA is an easy processing channel black; Continental A and D, medium processing channel blacks; Continental F, hard processing channel; Continental R-20, R-30, and R-40, conducting channel blacks; and AAA, an extra-coarse channel no longer commercially available.

The formulations for the natural rubber, GR-S, GR-M, and GR-I compounds studied are given in Table 1.

TABLE 1. FORMULATIONS FOR COMPARING CHANNEL BLACKS OF DIFFERENT PARTICLE DIAMETER

(Parts by Weight)

	Natural Rubber	GR-S	GR-I	GR-M
Elastomer	100	100	100	100
Zinc oxide	7.85	5	5	5
Pine tar	3	5		
Stearite regular*	3.30	2		1
Stearite A*			1	
Sulfur	2.81	2	2	
Mercaptobenzothiazole	0.743	1.5	0.5	
Light calcined magnesia				4
R. P. A. No. 3				2
Light process oil				1
Phenyl-β-naphthylamine				2
Benzothiazyl disulfide				0.75
Tetramethylthiuram disulfide			1	
Carbon black	50.5	50	50	31
Carbon black (vol./100 vol. elastomer)	25.8	26.0	25.6	21.5
Cure temperature, °F.	280	307	307	307

*Rubber-grade stearic acid prepared by hydrogenation.

In Figure 2, modulus for the cure giving optimum tensile is plotted against particle diameter of the channel blacks. For GR-S and GR-M, modulus appears to be independent of particle diameter over the entire range of channel blacks. Natural rubber and GR-I behave similarly with the exception of the decrease in modulus for R-30 and R-40. The difficulty in making adequate allowance for the slow rate of cure of these blacks may explain these low modulus values.

For the formulations in Table 1, Williams plasticity number increases—corresponding to a decrease in the plasticity of the stock—with particle diameter of the channel blacks (Figure 3). The fact that the Williams plasticity values are the same or higher for R-30 and R-40 than for coarser blacks in natural rubber and GR-I supports the supposition that the decrease in modulus is due to the effect of these blacks on rate of cure. Increase in Williams plasticity with decreasing particle diameter or increasing specific surface area may be related to the adsorption and immobilization of elastomer on the particle surface. However, in view of the fact that modulus is constant, adsorption does not seem to be the only factor although it is possible that the uncured stock is adsorbed in appreciable quantities; whereas the vulcanized elastomer is not.[4]

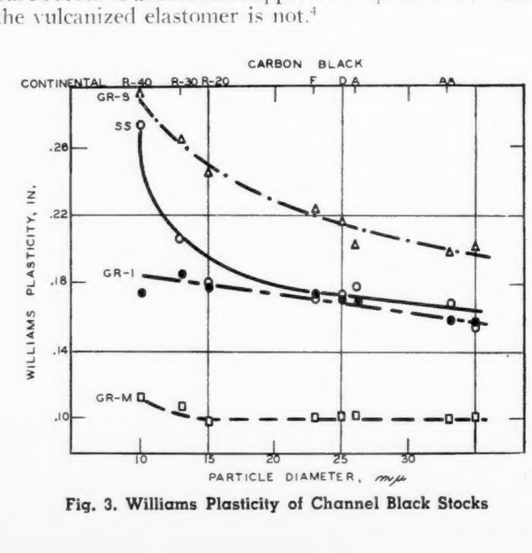

Fig. 3. Williams Plasticity of Channel Black Stocks

The increase in Williams plasticity, which is not in accord with the theoretical equations, has an interesting corollary in the behavior of the viscosity or consistency of a paint as a function of the specific surface of the pigments present. Viscosity of a suspension, as we have already seen, should depend on the volume of suspended material in a manner analagous to the equations for modulus and should be independent of specific surface. Figure 4 is taken from a paper presented at a joint symposium of the Colloid and the Paint, Varnish, and Plastics divisions at the one hundred and eleventh meeting of the American Chemical Society (6). Consistency in paint, like Williams plasticity in rubber, increases with increasing specific area of the calcium carbonate extender pigment. As suggested in the previous paper, an explanation for this increase in consistency is that it depends on the increase in the number of pigment particles per unit volume that accompanies reduction in particle size. If one considers that to a certain extent the suspension medium may be thought of as flowing through a framework of the suspended particles, then it can be shown that the resistance to flow increases as the number of particles increases. The same reasoning may also apply to the plasticity of unvulcanized rubber. In the vulcanized material, however, the rubber network is much larger than the particles so that flow of the rubber molecules through the particle framework cannot take place; and modulus, unlike plasticity, is essentially independent of the number of particles present.

TABLE 2. PROPERTIES OF CALCIUM CARBONATES

	Witco AA Whiting	Micronized Whiting	Witcarb R-12	Witcarb R
Principal chemical constituent	Natural $CaCO_3$	Natural $CaCO_3$	Precipitated $CaCO_3$	Ultra-fine precipitated $CaCO_3$
Crystal type	Calcite	Calcite	Calcite	Calcite
Average diameter, mμ	3,900	1,500	145*	50*†
Surface area sq. m. per g.	0.55	1.4	13	32
Sludge pH	8.8	8.6	9.1	11.3

*Determined from electronmicroscope photographs.
†Determined from X-ray diffraction patterns. Recent results have given lower values of the order of 30 mμ for Witcarb R.

We noted previously that carbon blacks, because of possible variations in the asymmetry of their exceedingly stable aggregates, are not the best pigments for the study of the effect of particle size on elastomer properties. Finely divided calcium carbonates are more suitable since their particles are fairly symmetrical, and the tendency for irregular aggregate formation is practically nonexistent. Moreover calcium carbonate pigments of almost identical chemical composition and crystal structure (calcite) are available over a wide range of average particle diameters. Properties of four calcium carbonate pigments are listed in Table 2. The average diameter of the fine material, Witcarb R, is given in the table as 50 millimicrons, but more recent results indicate that the average diameter may be closer to 30 millimicrons. The coarsest carbonate has an average diameter of about 3,900 millimicrons. Although the differences in pH might appear to indicate some difference in the nature of the particle surface, work in both rubber (7) and paint (6) has shown that the pH differences do not affect most of the properties of compositions containing these carbonates. The rubber and GR-S compounds used for determining the effect of particle size of the calcium carbonates are given in Table 3.

[4] Although the behavior of the modulus of the channel black and also, as will be shown, of calcium carbonate stocks indicates that an *appreciable amount* of elastomer is not adsorbed and immobilized at the surface of these pigments, it does not follow that the elastomer is not adsorbed at all. Some adsorption must be assumed if slippage at elastomer-pigment interface is not to occur. Likewise, the behavior of tensile class properties indicates that adsorption of elastomer occurs at least to a sufficient extent to increase the energy required to separate elastomer chains from each other.

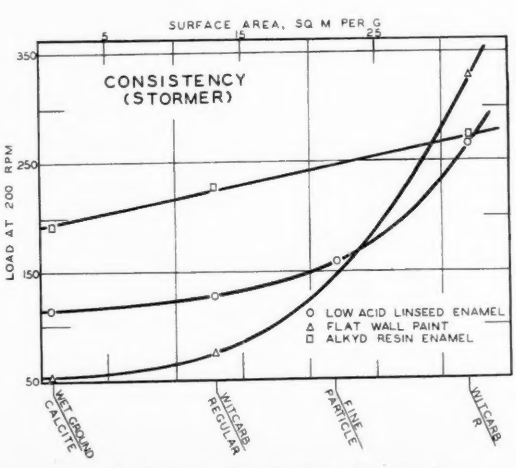

Fig. 4. Consistency of Paints Containing Calcium Carbonate Extender Pigments

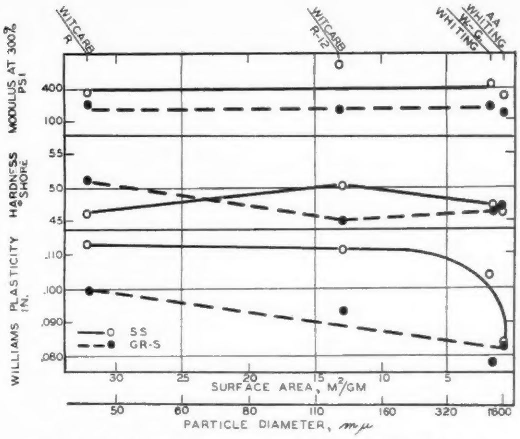

Fig. 5. Modulus, Hardness, and Williams Plasticity of Smoked Sheet and GR-S Containing Calcium Carbonates

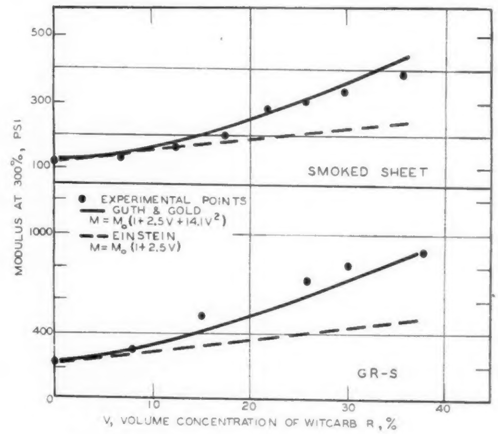

Fig. 6. Witcarb R in Smoked Sheet and GR-S

In Figure 5, modulus, hardness, and Williams plasticity number are plotted against the average particle diameter and specific surface area of the calcium carbonates. For both natural rubber and GR-S, modulus is essentially constant, in agreement with the theoretical equation and with the behavior of modulus for the series of channel blacks. Likewise, Shore hardness shows no trend with specific surface area. In view of the great

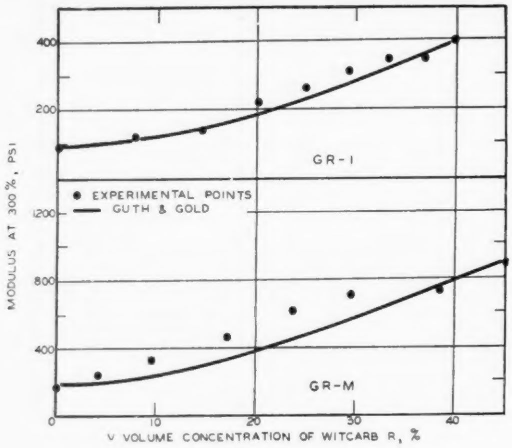

Fig. 7. Witcarb R in GR-M and GR-I

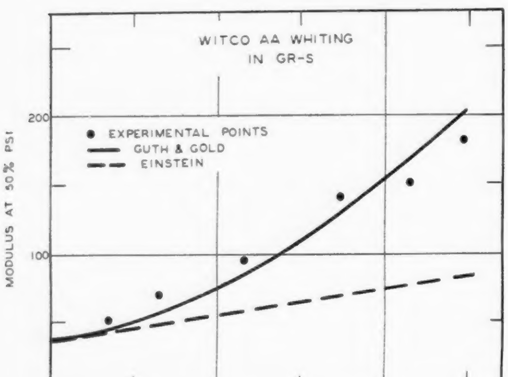

Fig. 8. Witco AA Whiting in GR-S

difference in surface area between the finest and the coarsest pigment, this behavior would indicate that there is no appreciable amount of vulcanized rubber or GR-S adsorbed at the surface of the calcium carbonate particles. Williams plasticity number increases slightly as particle size decreases, just as in the channel black series. This behavior may be accounted for by: (1) the cross-linking effect of the very fine pigment particles which prevents flow and increases the Williams plasticity value; (2) the binding of a portion of the unvulcanized elastomer chains on the pigment surface with a resultant increase in the ratio of dispersed phase to elastic medium; or (3) the effect of the increase in the number of solid particles accompanying decreased average diameter.

TABLE 3. FORMULATIONS FOR COMPARING CALCIUM CARBONATES OF DIFFERENT PARTICLE DIAMETER

(Parts by Weight)

	Natural Rubber	GR-S
Smoked sheet	100	—
GR-S	—	100
Zinc oxide	5	5
Pine tar	2	—
Hard para-coumarone-indene resin	—	30
Stearite	3	1
Sulfur	2.73	3
Santocure	—	1
Diphenylguanidine	—	1.5
Benzothiazyl disulfide	1.25	—
Calcium carbonate	80	107
Calcium carbonate (volumes)	30	40
Cure temperature, °F.	287	287

Effect of Loading

The theoretical equations predict that modulus should increase as the volume loading increases. If loading is expressed as the ratio of pigment volume to total volume of the compound—that is, as volume concentration—the Einstein equation predicts a linear increase in modulus. The other equations require a more rapid rise.

Figure 6 compares the experimentally determined modulus with the theoretical equation for a series of smoked sheet and GR-S stocks containing from 0 to 70 volumes of Witcarb R per 100 volumes of rubber (*7, 8*). The experimental points agree quite well with the solid curve representing the Guth and Gold equation. The broken line, obtained from the Einstein equation, gives values which are too low. Even at the highest loading—38.5% volume concentration, which corresponds to 202 parts by weight—the simple theoretical equation of Guth and Gold for symmetrical particles seems to apply, and no shape factor or particle network formation need be assumed. Electronmicrographs (*7*) also indicate that the particles of precipitated calcium carbonates, such as Witcarb R, are symmetrical.

In Figure 7, experimental moduli for GR-M and GR-I are plotted against volume concentration of Witcarb R. Just as in natural rubber and in GR-S, the experimental points follow approximately in the Guth and Gold equation (*7*). This agreement with the theoretical equation, in which we have used the actual pigment volume uncorrected for any adsorbed elastomer, seems to indicate that no appreciable amount of elastomer is adsorbed by the calcium carbonate, which confirms the previous results obtained with channel blacks and with calcium carbonates of varying diameter. Nevertheless, as a further check, a series of loadings of a coarse calcium carbonate was run. In this case the pigment surface area would be negligible. It was found that, both in rubber (*8*) and in GR-S, modulus at fairly high elongation (300%) increased much more slowly than predicted by the Guth and Gold equation; in fact, the modulus was almost independent of loading. For a coarse pigment it is possible that, at high elongation, slippage of the elastomer at the particle surface may complicate the problem; therefore measurements were made at 50% elongation in GR-S. Results (Figure 8) follow within the limits of experimental accuracy the solid line corresponding to the Guth and Gold equation.

Figure 9 shows the relation between modulus and loading for a high modulus furnace black, Continex HMF. The formulation for the natural rubber and the GR-S stocks and detailed test data have been previously published (*8, 9*). The graph indicates a much more rapid increase in modulus with loading than was found for the

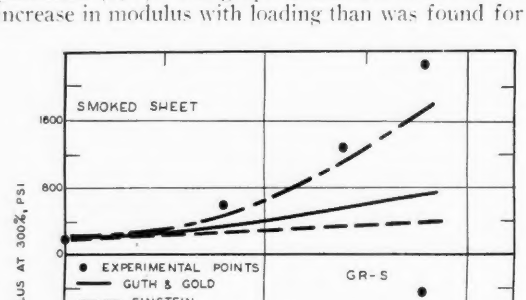

Fig. 9. Continex HMF in GR-S and Smoked Sheet

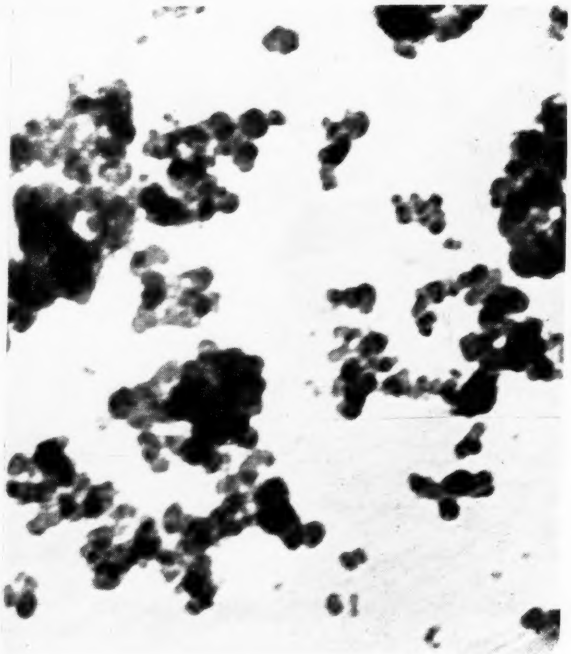

Fig. 10. Sterling L (HMF) at 55,000x (Courtesy Godfrey L. Cabot, Inc.)

calcium carbonate pigments. The Einstein and the Guth and Gold equations give values far below the experimental points. For both smoked sheet and GR-S the best agreement is obtained with the equation derived by Guth for rod-shaped particles using a shape factor, f, equal to six. This relation appears to agree fairly well with the data up to a volume concentration of about 28.5%, which is equivalent to 80 parts by weight. However at 36% (120 parts) the modulus is higher than given by the Guth equation. We have already pointed out that at high loadings irregular elongated particles may lock together to produce an increase in effective shape factor. This would lead to higher moduli than calculated using f equals six, which is found appropriate at loadings up to about 80 parts. In commercial compounds, loadings of more than 80 parts of HMF-type black would hardly ever be used.

The electronmicrograph of Sterling L (HMF) shown in Figure 10 indicates that a shape factor of six is plausible for high modulus furnace black. Although it is rather difficult to determine the actual shape factor of a three-dimensional object from a projection on a plane, an estimate has been made by dividing the largest linear distance measured along the carbon chain by an average of the diameters of the largest and the smallest individual particles observable in the chainlike aggregates. In the absence of stereoscopic pictures this procedure was thought to give the closest approximation of the shape factor. Measurements made in this way gave average values for HMF of from five to eight for various fields, one of which is shown in Figure 10. For Continex SRF, known to be somewhat less asymmetrical than HMF, a value of about five was obtained from previously published electronmicrographs (10, 11).

The data presented indicate that, provided the shape of the pigment particles and stable secondary aggregates is taken into consideration, in many cases the dependence of modulus on amount of carbon black and calcium carbonate in the compound may be accounted for in the normal commercial loading range by theoretically derived equations.

For the compounds in Table 1, durometer and plasticity also increase with increasing loading in qualitative agreement with the theoretical requirements (7). However these measurements do not give values of stress for a constant strain, and their relation to volume loading is somewhat more complicated than in the case of modulus.

The practical significance of the agreement between the experimental values and the theoretical equations is worth emphasizing. Provided experiments with other pigments confirm the indications given in this paper, it will be possible to calculate modulus at any loading from measurements made at only one loading for a filler composed of symmetrical particles or approximately rod-shaped particles of known shape factor.

Tensile, Tear, Tensile Product

In the case of the tensile class of properties no theoretical relation has been derived for the dependence of the elastomers either on pigment loading or on the structure of the elastomers themselves. It has been found empirically that longer chain lengths tend to give higher tensile and tear (12). Likewise, cross-linking of the chains, as in vulcanization, produces enormous increase in tensile; while crystallization of the elastomer by stretching or freezing (13) and the addition of finely divided pigments also increase tensile.

A simple calculation shows that if rupture involved the breaking of a large fraction of the chains in a unit cross-section, ultimate tensiles would be many times higher than observed. This fact leaves a choice between two possibilities for the predominant factor in determining tensile: (1) the energy required to rupture a small fraction of the total chains—for example, those of median length—and (2) the energy required to separate the elastomer chains from each other. Assuming that the second of these possibilities is correct, the forces that might have appreciable effect in holding the chains together are: (1) chemical cross-links produced by vulcanization or other means; (2) forces produced by crystal formation along part of the chain length; and (3) adsorption cross-links produced by the action of the surface of finely divided pigments. The tensile class of properties would then be a function of all three of these effects. The mutual attraction of elastomer chains in the amorphous state may be neglected since the tensile strength of unvulcanized gum stocks is practically zero.

On the basis of these concepts, pigments act as binding agents holding the rubber chains together by virtue of the adsorption of these chains on the particle surface; consequently the more finely divided the pigment—the

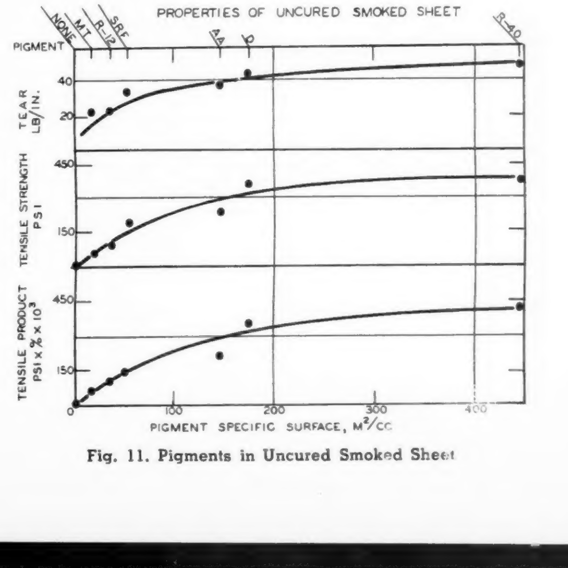

Fig. 11. Pigments in Uncured Smoked Sheet

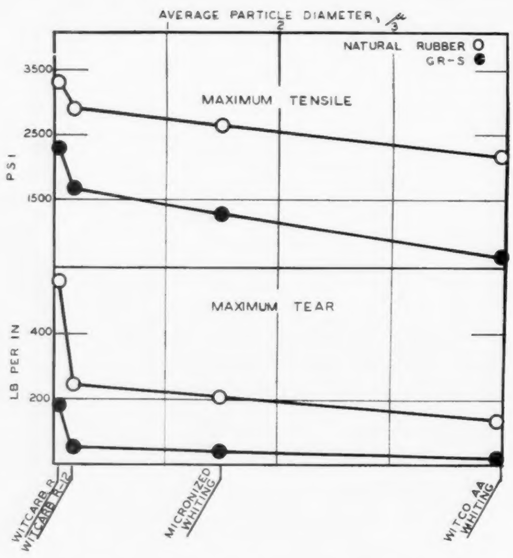

Fig. 12. Tensile and Tear of Smoked Sheet and GR-S Containing Calcium Carbonates

greater the number of particles and the greater the available surface on which the rubber may be adsorbed— the stronger the binding. That is, tensile properties should increase as average particle diameter decreases. Likewise, as loading increases, both the number of particles and the total particle surface area present increase so that tensile should also increase. Increased loading, however, also dilutes the elastomer, that is, reduces the number of chains which have to be separated in order to rupture a unit cross-section so that a point will be reached at which the number of rubber chains decreases more rapidly than the tightness of binding increases; and further increase in pigment will result in a lower tensile. Thus tensile should increase to a maximum with loading and then decrease.

The simplest case in which to test the validity of these qualitative predictions concerning the effect of pigments on tensile is in unvulcanized natural rubber. Since practically no cross-links are present in unvulcanized rubber, the effect of pigments can be examined without this complicating factor. Figure 11 shows that tensile, tensile product, and tear resistance of uncured smoked sheet containing 26 volumes of pigment increase as the specific surface area of the pigment increases. At least in this series of results neither the chemical nature of the surface nor the shape factor appears to be important in determining tensile class properties since Witcarb R-12, a precipitated calcium carbonate, and medium thermal black, both of which consist of symmetrical particles, are roughly in line with the values for the furnace (Continex SRF) and channel blacks (14).

In vulcanized elastomers vulcanization bonds or a related number of carbon-to-carbon bonds in the rubber chains must be broken before rupture can take place. The binding force of these chemical bonds is then superimposed on the effect of the pigments. Nevertheless in vulcanized elastomers tensile properties also increase with decreasing particle diameter. A large amount of published data have shown that this is the case for carbon blacks, and Figure 12 indicates that tensile and tear increase with decreasing particle size for calcium carbonates.

In elastomers such as natural rubber, GR-M, and GR-I, crystallization forces must also be considered, and, at least at low pigment loadings, the presence of these forces leads to higher tensile and tear values than in GR-S and acrylonitrile copolymers, which do not crystallize. Figure 13, which shows a series of loadings of Witcarb R in various elastomers, illustrates this point nicely. Also, as loading increases, tensile increases to a maximum and then decreases for all elastomers except GR-I, where the maximum may have been below 25 parts loading. The increase in tensile is much more marked for the non-crystallizing polymers—GR-S and Hycar—and the maximum occurs at much higher loading than for the crystallizing polymers. The reason may be that the formation of crystallites, as the rubber is stretched, leads to a decrease in amount of elastic phase; the crystallites act very much like pigment particles and cause an effective increase in loading.

Tear results for the same compounds are also shown in Figure 13. Like tensile, tear increases to a maximum with loading, but the maxima occur at higher loadings. Since the tear test does not result in high elongation and crystallization to the same extent as tensile, it is not surprising that tear for the crystallizing polymers increases more sharply with pigment, and in this respect the polymers that crystallize resemble GR-S and Hycar more closely than in the case of tensile.

Although we do not have available quantitative relations between pigment loading and tensile properties, we may conclude that the concept of finely divided pigments acting as bonds tying the rubber chains together leads to qualitative predictions which are in agreement with experimental data.

Summary

Modulus appears to be independent of average particle diameter. With respect to the dependence of modulus on loading, calcium carbonate pigments which are symmetrical follow the equation derived by Guth and Gold for the relation between modulus and volume concentration of symmetrical inelastic particles. Up to about 80 parts by weight loading, HMF black follows a similar equation derived for rod-shaped particles, assuming a value of six for the ratio of the length to the diameter of the particles. The agreement with these theoretical equations is surprisingly good and holds out the eventual possibility of calculating modulus over a wide loading range from tests at a single loading. Hardness and plasticity increase with loading in qualitative agreement with the equations.

(*Continued on page 354*)

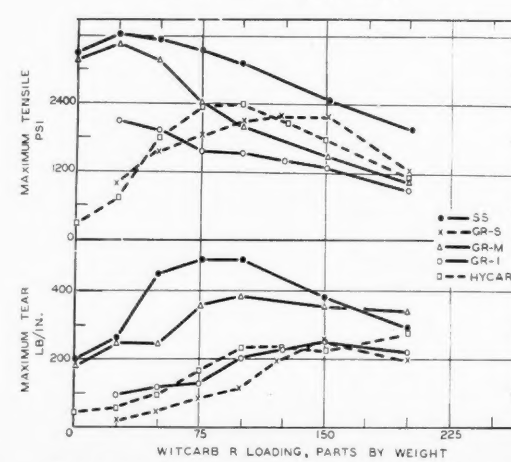

Fig. 13. Tensile and Tear of Witcarb R in Natural and Synthetic Rubbers

An Improved Procedure for Painting Plants in the Rubber Industry

James S. Thayer[1]

Fig. 1. Tire Building Area after Painting; "Green" Tires Are Conveyed to Inspection Stations prior to Shaping Operations

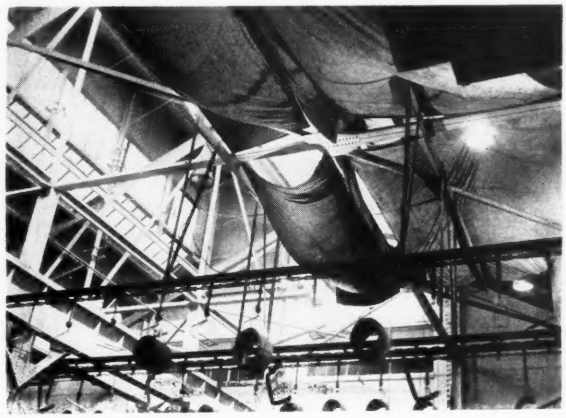

Fig. 2. Drop-Sheets as Used Adjacent to the Tire Building Area

EARLY in 1947 it was decided to paint the Kelly-Springfield Tire plant at Cumberland, Md., but when it came to arranging the details, it was something like putting a bell on the cat; everybody agreed it should be done, but there were differences of opinion on how it should be done and who should do it. Every time the matter was discussed, those responsible for production schedules and product quality became alarmed over the possibility that the painting operations would reduce output and result in considerable product contamination.

It was obvious that in order to get the actual painting started a plan of procedure that would appeal to all executives and superintendents was necessary. Such a plan would then assure cooperation from all department heads and persons whose work might be made more difficult by the presence of painters and their equipment. Many problems had to be solved in order to arrive at an acceptable plan, and we finally became convinced that the job might be done best by an outside painting organization. Even though we had our own permanent crew of excellent painters, so much was involved in the large-scale painting program we were contemplating that the industrial painting firm with supervisory personnel trained and experienced in the problems of the manufacturing industry seemed to us the most advantageous solution of our problem.

After receiving proposals from several firms of industrial painters, we selected Oliver B. Cannon & Son, Inc., Philadelphia, Pa., for two principal reasons: first, because of its nationwide experience in industrial painting and, second, because its plan of procedure, submitted after a thorough analysis of the painting requirements while at the same time taking into account the production flow and scheduling in our plant, seemed most likely to get the job done with the least interference with our manufacturing operations.

Adjustment of Painting to Manufacturing Schedules

As a result of this analysis of our painting problem, made with the help of the chief engineer and the plant superintendent, Cannon suggested a three-year painting program along the following lines:

All rooms and areas were classified according to their need of painting. A number "one" classification of a room or area indicated a need of immediate painting; a number "two" classification indicated that the area needed painting, but the need was less urgent than in the number "one" classification, and a number "three" classification bore a similar relation to the number "two" classification in the program. The different areas were then listed in order of their need of painting according to this classification method.

The advantages of a painting program scheduled over a period of three years are especially noteworthy. First, the appropriation for the work can be budgeted over a longer time, and, second, it is possible to arrange for the painting of the various areas during seasonal slowdowns not only during one 12-month manufacturing period, but three.

Painting of the number "one" areas at the Kelly-Springfield plant was programmed for completion in 1947. It was necessary, therefore, to begin by coordinating the 1947 painting program with our tire and tube production schedule for the current year. By studying the production flow sheet for the plant and recording on a chart periods when each room and department was shut down or operating at a reduced rate and then comparing this available time with the estimated man-hours required to paint each area, an overall working schedule was developed. In this way the most efficient use of the painter's labor force was obtained with the minimum of interference with our regular manufacturing operations. How well this plan worked out is best illustrated by the following example:

The tire building area required an estimated 300 man-hours of painting time. To keep interference with production to a minimum, it was decided to paint this area

[1] Chief engineer, Kelly-Springfield Tire Co., Cumberland, Md.

Fig. 3. Mill Line Area

only during shutdown periods which occurred only one hour in each 24, except on Sundays when this department was shut down for the full 24 hours. The area was painted in two weeks by using a half-dozen painters for one shutdown period each day and for the full 24 hours on one Sunday, without any reduction in our tire production rate. During the regular working days, as soon as the time available for painting in the tire building area had elapsed, the painters moved on to another area determined by consulting the chart previously referred to. The improved appearance of the tire building area after the painting was completed is shown in Figure 1.

The rooms and departments where it is impractical to have painters work except during shutdown periods are termed "vital" areas and are so indicated on the painting program chart with their manpower and time allotments. Other areas, where painters can work using overhead drop-sheets to protect machinery and workers (see Figure 2), were scheduled so as to absorb the painting crews when they left the "vital" areas at the end of the shutdown periods.

Importance of Proper Cleaning Methods

Of great importance in painting any plant manufacturing rubber goods is the necessary operation of cleaning surfaces before painting. Carbon black, talc, and dust and dirt must be removed in such a way as to reduce floating particles to a minimum, which means that the dust and dirt must be removed, not just displaced. Dirt from all overhead parts of the rooms should be carefully worked into the drop-sheets mentioned above. Many man-hours can be saved and interference with manufacturing operations avoided if surfaces are cleaned well in advance of the arrival of the painters in a given area. The cleaning work, however, should be so arranged that the drop-sheets can be used not only to protect the men and machines below from dust and dirt, but also from paint. In other words, the cleaning and painting in each area should be scheduled so as to require putting drop-sheets in place only once.

Fig. 5. Inspection and Finishing Department for Truck and Bus Tires

Spray Painting

Painting with spray guns can often be done efficiently and economically in such rooms as warehouses and areas that can be sealed off and the contents protected by drop-sheets. When the spray painting method is used, it is very important that the area be completely closed off since air currents can play peculiar tricks with atomized paint particles, carrying them down corridors or up elevator shafts to settle on machinery and products. For example, there was the case of a manufacturer who failed to close the windows of his plant while it was being painted by the spray method and found later that an air current had carried paint spray up an alley and deposited paint particles on the machines and product in a factory where cloth was being processed.

Fig. 4. Wind-Up End of Calender

The Use of Color

It was with some misgivings that we accepted the recommendations of the Cannon company for the use of a variety of harmonious colors in certain parts of the plant. Actually, the result has been most pleasing and practical. The use of the proper colors in the right places has provided better light where most needed, made for greater safety in aisles and on stairways, and the use of contrasting colors between rooms as well as between ceilings and walls has been both pleasing and restful to the eyes. Unattractive networks of pipes and overhead beams were made less conspicuous when painted in subdued colors. The offices and certain departments were painted in greys, off-whites, and several tones of cool green. The cafeterias and lunchrooms were painted in a combination of buff and brown, and again the beneficial effect of the use of these contrasting colors was noticeable.

Summary and Conclusions

It is obvious that this plan of procedure for painting industrial plants requires not only a thorough knowledge and charting of production operations in every case, but

(*Continued on page 354*)

The Solubility of Hydrocarbon Resins and Their Behavior in Rubber Compounds[1]

P. O. Powers

COUMARONE-INDENE resins are often used as softeners and extenders for natural and synthetic rubbers. With GR-S, these resins reinforce compositions loaded with light-colored fillers.[3] However the degree of reinforcement varies greatly with different resins, and these differences could not be correlated with any of the properties which are usually determined. It was felt that these differences might be associated with the solubility of the various resins in the cured rubber.

It had been found that the degree of swelling of synthetic oil-resistant rubber caused by various compositions of hydrocarbon oils could be predicted from the aniline point of the oil.[4] Attempts to measure the solubility of various hydrocarbon resins in uncured samples of natural and synthetic rubber were not entirely successful, and measurement of solubility in cured sheets appeared even more difficult.

Indene has been polymerized, and the resulting polymer fractionated.[5] The melting point increased with the molecular weight of the sample. Since solubility decreases with molecular weight, it is probable that in the polyindene series melting points may be a measure of solubility. Commercial resins, however, are made from many materials other than indene; several starting materials may be used for a single resin. The melting point does not necessarily reflect the solubility of the resin, although the melting point[6] has been suggested as an index to the performance of coumarone-indene resins.

A search was, therefore, made for some measure of relative solubility of coumarone-indene resins which would be used to classify them. The cloud point[7] has been found to be a useful index of the solubility of a wide variety of synthetic resins. The cloud point is determined by heating a sample of resin in a reference oil until a clear solution is obtained and observing the temperature at which the solution becomes opaque on slowly cooling. Cloud points were determined on the coumarone-indene resins used in this study to classify them according to their relative solubility.

Determination of cloud point is usually made at high resin concentrations since the solubility characteristics of the resin as a whole are reflected under these conditions. At low resin concentrations the effect of the less soluble constituents predominates.

Cloud-point determinations over the whole range of resin concentrations may be readily made and afford an instructive pattern of the solubility behavior of various resins. The behavior[8] of another hydrocarbon resin, polystyrene of low molecular weight, is shown in Figure 1. In this case the behavior of one resin in a mixture of octadecane and toluene is shown. The numbers on the curves in Figure 1 refer to the percentage of toluene in the mixture. The behavior of other hydrocarbon resins in a series of solvents is entirely comparable. This type of diagram is believed to be typical of resin-plasticizer systems in general.[9]

After a heated solution of resin and plasticizer has been cooled, separation often occurs, giving a solution of the plasticizer in the resin, and a solution of the resin in the plasticizer. The latter solution may be quite dilute.

In the case of rubber or synthetic rubber, coumarone-indene resin systems, it has not been possible to establish the ranges of solubility. It is believed, nevertheless, that the behavior of the resins in rubber compositions can be explained in terms of such systems.

Materials

Six coumarone-indene resins were obtained from the Barrett Division, Allied Chemical & Dye Corp. Melting points and cloud points were determined by the supplier, and these values are shown in Table 1. It will be noted that melting points vary from about 85-135° by the cube in mercury method.[3] The cloud point varies over a much wider range, and there is no apparent correlation between melting and cloud point.

TABLE 1. PROPERTIES OF COUMARONE-INDENE RESINS

Resin Designation	Cloud Point (°C.)	Melting Point (°C.)
A	< 0	84.5
B	46	120.8
C	49	134.5
D	62	150.1
E	93	102.0
F	116	133.3

Three types of rubber were chosen for study: Chemigum N-3, a nitrile-type rubber; a styrene-butadiene copolymer, GR-S-38; and natural rubber. The recipe used for these rubbers is given in Table 2. The basic recipe without resin was milled as two masterbatches; six parts of rubber were milled with the accelerator; the balance (94 parts) of rubber was blended with the other ingredients, and the resin incorporated at 130-180° F. as required. The calculated amount of accelerator masterbatch was added after cooling, and the finished batch was thoroughly blended again. All samples were cured at 305° F.

TABLE 2. RECIPES OF STOCKS STUDIED

	I	II	III
Chemigum N-3	100		
GR-S-38	—	100	—
Smoked sheet	—	—	100
SRF black	50	—	—
EPC black	—	50	—
MPC black	—	—	40
Stearic acid	0.5	1.5	3.0
Zinc oxide	5.0	5.0	5.0
Sulfur	1.6	2.0	3.0
Phenyl-β-naphthylamine	—	—	1.0
Benzothiazyl disulfide	1.25	—	1.0
Mercaptobenzothiazole	—	1.5	—
Diphenylguanidine	—	0.5	—
Resin		Variable	

In the case of the nitrile-type rubbers the cure time was not greatly affected by addition of the resin, but in the case of GR-S, and to an even greater degree with natural rubber, longer curing times were required to

[1] Presented before the Pacific Industrial Conferences of the California Section, A.C.S., San Francisco, Calif., Oct. 24, 1947. This paper was a part of the program arranged by the Northern California and Los Angeles Rubber groups.

[2] Battelle Memorial Institute, Columbus, O.

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[9] H. Jones, *Trans. Inst. Rubber Ind.*, 21, 5, 298 (1946).

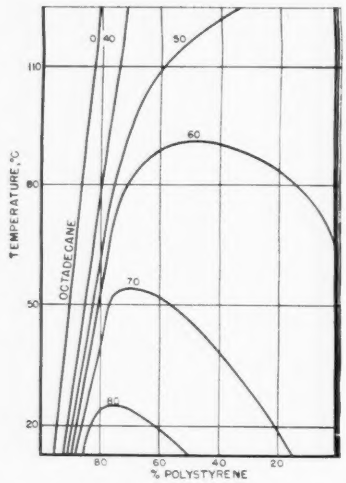

Fig. 1. Solubility of Polystyrene in Hydrocarbons

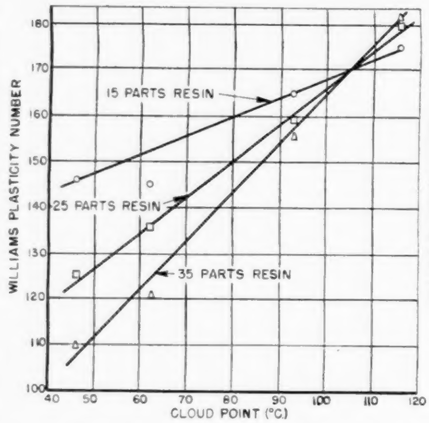

Fig. 2. Cloud Point of Resins and Williams Plasticity of GR-S Samples

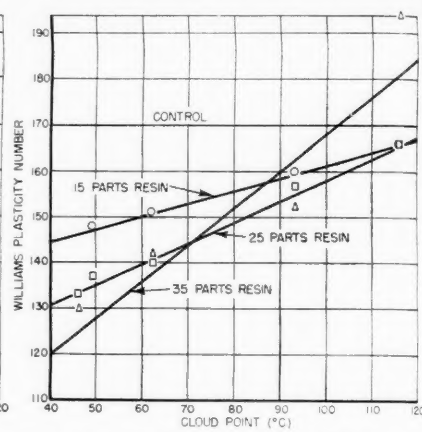

Fig. 3. Cloud Point of Resins and Williams Plasticity of Chemigum Samples

effect an optimum cure. Whether this effect is entirely physical is not entirely clear. It may be the softening effect of the resins must be balanced by a tighter cure. It has been suggested that unsaturation of the resins was responsible for the longer curing time. If sulfur was taken up by the resin, addition of more sulfur might be expected to compensate for this loss, but this experiment was not made.

Test Methods

Williams plasticity was determined on the blended samples before curing. The plastometer was held at 70° C. eight hours before making any determinations. Samples which had been milled the previous day were conditioned at least 15 minutes at 70°. Plasticity values were measured after three minutes' compression. Recovery values were determined after 15 minutes' recovery.

Type C A.S.T.M. dumbbells were used for measuring tensile properties of the cured samples; all tests were carried out at 78° F. Hardness was measured on the Shore A-2 durometer, mounted to apply at two-pound load, and measurements were made 15 seconds after applying the load. The reading had, in most instances, become constant at this time.

Results

Table 3. Properties of GR-S-38 Compounds

Cloud Point of Resin	Williams Plasticity No.	Shore Hardness	300% Stress P.S.I	Tensile Strength P.S.I.	Elongation %
Control	171	54	1200	2940	560
		15 Parts Resin			
<0	136	42	660	2250	660
46	146	55	980	3060	640
62	145	55	1050	2880	590
93	165	65	1330	2690	500
116	175	68	1310	2400	480
Dioctyl phthalate	123	54	1300	2790	510
		25 Parts Resin			
46	125	54	980	2900	620
62	136	49	610	2500	750
93	159	65	1140	2620	560
116	180	70	1260	2290	510
		35 Parts Resin			
46	110	53	770	2580	630
62	121	48	580	2290	700
93	156	68	1030	2600	610
116	182	71	1130	1920	510

The plasticity, hardness, and tensile data for GR-S-38 stocks are given in Table 3. Because of the apparent retardation of the cure by the resins, considerable variation was found in the curing time for optimum cure. The time was usually greater with low cloud-point resins and with higher resin contents. The test data in Table 3 are for the compounds exhibiting the highest tensile strength. When two cure times exhibited approximately the same tensile strength, an average of the physical properties is shown in the table.

The physical data for the nitrile-type rubber are shown in Table 4, and the values are an average of the 40- and 60-minute samples at 305° F. In this series there was little evidence of retardation of the cure by the resins; optimum tensile was achieved at about the same time as the control samples containing no resin.

Table 4. Properties of Chemigum N-3 Compounds

Cloud Point of Resin	Williams Plasticity No.	Shore Hardness	300% Stress P.S.I.	Tensile Strength P.S.I.	Elongation %
Control	169	65	2120	2320	360
		15 Parts Resin			
<0	139	55	1600	2840	600
46	139	60	1690	2260	540
49	148	58	1580	2660	580
62	151	60	1720	2540	480
93	160	60	1580	2490	540
116	166	68	1980	2380	410
		25 Parts Resin			
<0	127	50	1210	2470	600
46	133	58	1420	2560	590
49	137	56	1340	2530	606
62	140	58	1460	2280	560
93	157	63	1310	2100	590
116	166	72	1550	2220	460
		35 Parts Resin			
<0	118	49	1020	2300	670
46	130	54	1040	2110	690
49	138	56	1140	2190	630
62	142	60	1380	2120	510
93	152	64	1080	1880	620
116	199	72	1400	1740	440

Table 5. Properties of Natural Rubber Compounds

Cloud Point of Resin	Williams Plasticity No.	Shore Hardness	300% Stress P.S.I.	Tensile Strength P.S.I.	Elongation %
Control	121	55	1110	3640	620
		15 Parts Resin			
46	97	54	840	2800	590
62	108	53	770	3070	650
93	111	59	910	3530	670
116	127	61	1180	3090	540
		25 Parts Resin			
46	88	53	560	2370	660
62	119	54	590	2450	640
93	118	62	960	3390	630
116	141	65	1310	2970	520
		35 Parts Resin			
46	95	47	350	1690	660
62	130	54	1060	1820	660
93	114	62	980	3130	630
116	138	66	1040	1640	410

The results with natural rubber are shown in Table 5. Here the variation in time of cure was most pronounced,

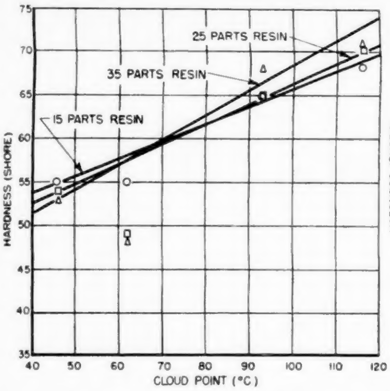

Fig. 4. Hardness *vs.* Cloud Point for GR-S-38 Samples

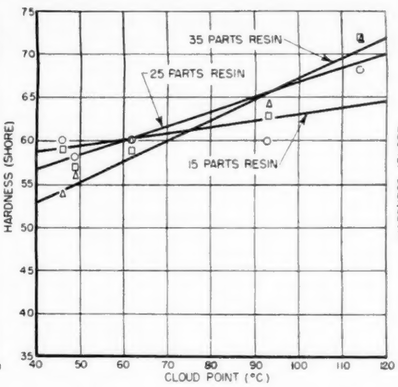

Fig. 5. Hardness *vs.* Cloud Point for Chemigum N-3 Samples

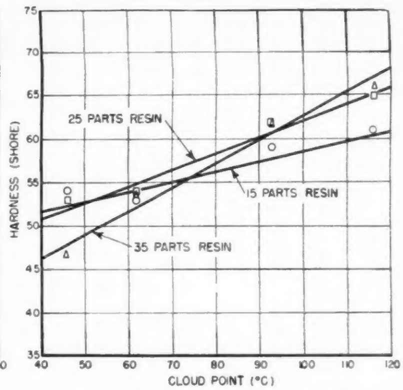

Fig. 6. Hardness *vs.* Cloud Point for Natural Rubber Samples

and with long cures the tendency of natural rubber to revert was noticeable. Separation of the resin was noticed in cases of high resin concentration. When the highest cloud point resins (F, Table 1) were used, the stocks had a fibrous appearance and tended to split in layers. The amount of resin used in these tests in most cases was higher than that recommended with natural rubber.

Discussion

The tables show in many instances definite trends with variation of cloud point of the resin. In the case of the plasticity and hardness values, there is a close correlation with the cloud point. The tensile properties show certain trends with the cloud point of the resin used, but variations in the time of cure may have modified the results.

Plasticity

The Williams plasticity numbers of the vulcanizates from GR-S and nitrile-type synthetic rubbers are shown in Figures 2 and 3. It is apparent that the plasticity decreases (as evidenced by increasing Williams plasticity number) as the cloud point of the resin increases and that the plasticity increases (lower Williams plasticity number) with increase of resin up to a critical cloud point. The results with natural rubber (Table 5) exhibit the same trends, but the points are badly scattered, probably owing to the wide variations in the time necessary to cure the samples. While the plasticity usually increases with the resin content, there appears to be a critical cloud point at which the plasticity of the compound does not change further as the resin content increases. Above the critical cloud point the plasticity decreases as the resin content increases.

This behavior is consistent with the solubility relation suggested above. The soluble resins, possessing low cloud points, are miscible with rubber and reduce the plasticity. As the cloud point increases, less resin is soluble in the rubber, resulting in less reduction in plasticity. In the case of the resin with the highest cloud point of the series, the plasticity is not reduced below that of the control stock. In this case the solubility of the resin may be so small as to result in no change in plasticity. It seems probable, however, that the resin which did not dissolve in the rubber may still be expected to reduce the plasticity of the compound.

Hardness

The Shore hardness results parallel the plasticity values, giving harder compounds as the cloud point increases (Figures 4, 5, and 6). In this case, however,

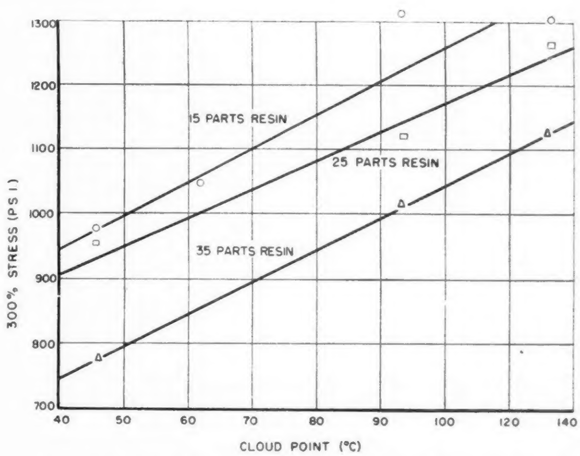

Fig. 7. Cloud Point *vs.* 300% Stress-GR-S-38 Compounds

the hardness is not greatly influenced by the amount of resin employed. There is some evidence of a critical cloud point as occurred with plasticity values, but this is not so clearly evidenced as in the case of the plasticity values.

It will be seen that the melting point of the resin does not reflect the hardness of compounds in which it has been incorporated. Resin E (Table 1) melts 50 degrees below Resin D, yet gives compounds of measurably greater hardness reflecting the 31 degrees higher cloud point. The lack of correlation of melting point with properties of resulting compounds is apparent throughout this work.

Tensile Properties

The 300% stress (modulus) of the compounds increases with the less soluble high-cloud-point resins. The results with GR-S compounds are typical of the behavior in the other compounds (Figure 7). The modulus approaches and in a few cases exceeds that of the control stock as the cloud point of the resin is increased (Table 3). Since additional carbon black was not added with increase in resin, this is equivalent to an increase in modulus. In this case there is no indication of a critical cloud point.

The results with natural rubber show the same trends. The erratic curing times, however, have made the values less readily comparable. One effect has been noted in the study of resin-rubber systems: namely, the change in the solvent power of the rubber as it is cured. In general,

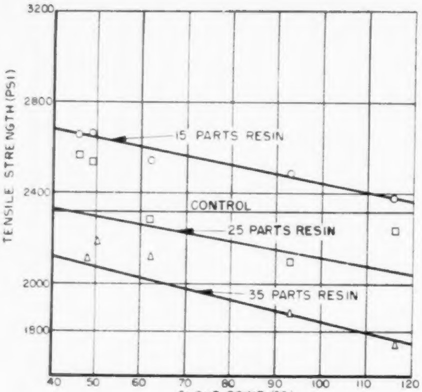

Fig. 8. Cloud Point of Resins and Tensile Strength of Chemigum Samples

natural or synthetic rubber becomes a progressively poorer solvent as it is cured. Thus a resin which apparently is soluble at a short cure behaves as if it were only soluble to a limited extent when the cure is prolonged.

The ultimate tensile strength is less as the cloud point or the amount of resin is increased (Figure 8). In this case a maximum value probably exists, but this value may occur at lower cloud points than used here. GR-S at 15 parts resin (Table 3) exhibits such a maximum as does natural rubber (Table 5). The ultimate elongation decreases with increase in cloud point or resin concentration (Tables 3, 4, and 5). No great decrease in elongation is observed, however, until high cloud points are attained.

Summary

The results shown here cover a much wider range both in resin concentration and in resin solubility than will be usually encountered in use of coumarone-indene resins in rubber. By use of such extreme conditions it has been possible to show the effect of resin solubility over wide limits.

Increasing the cloud point of the resin results in compounds of greater hardness, less reduction in plasticity, higher modulus, and lower elongation. This relation has been established in the case of coumarone-indene resins, but is believed to be applicable to other types of resin.

The physical properties obtained in resin-rubber compounds is believed to reflect the solubility of the resins in rubber. The soluble, low-cloud-point resins show the greatest softening effect; while higher cloud-point resins have a greater reinforcing action.

Painting Plants

(Continued from page 350)

it also requires the full cooperation of plant foremen and department heads—this latter being something that was achieved easily at Kelly-Springfield once the plan, procedure, and objectives were outlined at a meeting of all the plant personnel concerned. Certainly understanding removes many barriers of prejudice and apprehension in almost any type of undertaking.

We have been asked many times since deciding upon this long-term painting program whether we have found that the results justify the extra expense and effort involved. The consensus seems to be that it has, although it is most difficult to arrive at a figure for realization on the investment in terms of dollars and cents. Greater cleanliness of product, worker, and machines has already resulted, even though the program is only partially completed. This type of return does not lend itself readily to an immediate evaluation, but, of equal or even greater importance, we are conscious of much higher worker morale. The present-day appearance of several departments and areas of our plant, as shown in Figures 3, 4, and 5, provide easily understood evidence of our now confirmed belief that a painting program of the type finally decided upon is more than worthwhile.

The many advantages as well as the economy realized by using a firm of industrial painting specialists does not mean that we do not still use our regular crew of maintenance painters. It is necessary that our own crew carry on a continuous program of routine painting to protect surfaces and prevent deterioration. This type of work can be best done by our smaller staff but our experience has been that the industrial painting specialist with this "know-how" and his larger crew is a necessary part of any comprehensive, long-term painting program.

Mechanism of Reinforcement

(Continued from page 348)

Behavior of modulus as a function of loading and average particle diameter of pigments indicates that vulcanized natural or synthetic rubber is not adsorbed in appreciable quantities or with sufficient force to be rendered inelastic at the surface of either calcium carbonate or carbon black pigments.

Qualitative predictions based on the hypothesis that tensile strength is a measure of the force required to separate rubber chains from each other, rather than to break rubber chains, and that pigment particles act as cross-linking agents holding the chains together are in agreement with the behavior of calcium carbonate and carbon black pigments of widely different surface area over a considerable loading range.

Acknowledgment

The assistance of members of the staff of the Witco technical service laboratory, particularly of R. E. Smith, who made most of the calculations, and of Mrs. T. S. Newman, who prepared the figures, is gratefully acknowledged. The author is also indebted to W. R. Smith, of Godfrey L. Cabot, Inc., who made available the electronmicrograph of Sterling L.

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Contributions of Organic Chemistry to the War Effort—Synthetic Rubber—II[1]

R. F. Dunbrook[2]

THIS installment, the second of several to come, continues from our November issue the article by the former head of the Copolymer Research Branch of the Office of Rubber Reserve, which reviews the government research program on synthetic rubber from the viewpoint of the organic chemist.

Modifiers

Manufacture of Dodecyl Mercaptan (DDM)

The modifier is an essential ingredient in the GR-S recipe since the processability and the quality of the rubber are dependent upon the amount and type of modifier used.

Early in the synthetic rubber program a considerable amount of work was carried on to determine the type of modifier to be used in the rubber program to give the most satisfactory rubber. Diisopropyl xanthogen disulfide (15)[3] and dodecyl mercaptan (16) were already in use with different systems of polymerization and were given careful consideration. In general, mercaptans were found to function most satisfactorily in the GR-S recipe, and the one used was essentially dodecyl mercaptan, a primary mercaptan obtained from Lorol.

Lorol alcohol from cocoanut oil is used as the commercial source for the preparation of dodecyl mercaptan and is designated DDM. The major constituent of DDM is the C_{12} mercaptan although the commercial product includes smaller quantities of C_{10}, C_{14}, and C_{16} mercaptans which were shown to be of real value in giving a rubber superior to a pure cut of C_{12} mercaptan.

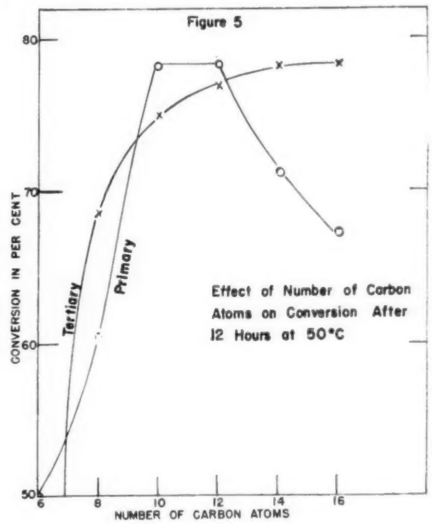
Since the quality of the rubber is largely dependent upon the type and the amount of modifier used in the recipe, considerable research was devoted to the effect of modifier on the rate of polymerization, the molecular weight distribution of the polymer, and the quality of the rubber. Methods of analysis for modifier in the latex were developed (17), and the rate of disappearance of different modifiers was determined. The function of the modifier in the reaction, its fate during polymerization, and the kinetics of its consumption were studied.

Tertiary dodecyl mercaptans, because of their availability and lower cost, were also considered as modifiers in the GR-S recipe. The polymers prepared with tertiary dodecyl mercaptans, however, are not equal in processability to those made with DDM. Some physical properties are also inferior to the polymers prepared with DDM.

The function of the DDM as catalyst, activator, and modifier in the GR-S recipe is aptly shown in the following table.

TABLE 6. FUNCTION OF MODIFIER IN GR-S RECIPE

DDM %	Hrs. @ 50° C.	Conv. %	Mooney Viscosity ML_4	Gel %	Intrinsic Viscosity
0	12	0	—	—	—
0.[illegible]	12	78	153 (hard)	77	0.8
[illegible]	12	78	95 (hard)	13	1.2
0.5	12	78	50 (soft)	0	2.1



Without mercaptan the reaction does not proceed at all. A very small amount of modifier is sufficient to cause the reaction to proceed, but gives tough undermodified polymers as indicated by high gel content, high Mooney viscosity value, and low intrinsic viscosity of the soluble portion. Increasing amounts of modifier give a softer polymer of lower gel content and lower Mooney value. The independence of the rate of polymerization with modifier is also demonstrated in the table.

The concentration of DDM required for maximum activation is very small. For instance, 0.0005% of DDM based on the monomers provides sufficient activation to give 70% conversion in 24 hours at 50° C.; while 0.005% is sufficient to give 70% conversion in 12 hours (18). With larger amounts of modifier the rate of polymerization is independent of the concentration. Thus the concentration of DDM can be varied between 0.02% and 1%, and that of tertiary dodecyl mercaptan between 0.1% and 1% without affecting the rate of polymerization.

The rate of polymerization varies with number of carbon atoms in the mercaptan reaching an optimum with C_{10} to C_{12} primary mercaptans (19). With tertiary mercaptans the rate reaches an optimum with C_{10} mercaptan and remains essentially constant with C_{10} to C_{16} mercaptans (Figure 5).

The modifying effect of 0.5% DDM is about the same as 0.3% t-$C_{12}H_{25}SH$ (20). Reaction times with tertiary C_{12} mercaptan are 3% to 5% longer than with DDM (21).

The rates of disappearance of primary and tertiary mercaptans in the GR-S recipe are shown in Figures 6 and 7 (20). The primary mercaptans disappear at a faster rate during polymerization than do the tertiary mercaptans. Also there is a wider spread between the curves for C_{12} and C_{14} primary mercaptans than between C_{12} and C_{14} tertiary mercaptans. The rate of disappear-

[1] Presented before Division of Organic Chemistry, A. C. S., Chicago, Ill., Sept. 11, 1946.
[2] Office of Rubber Reserve, RFC, Washington, D. C. Present address, Firestone Tire & Rubber Co., Akron, O.
[3] Bibliography references appear at end of this installment.

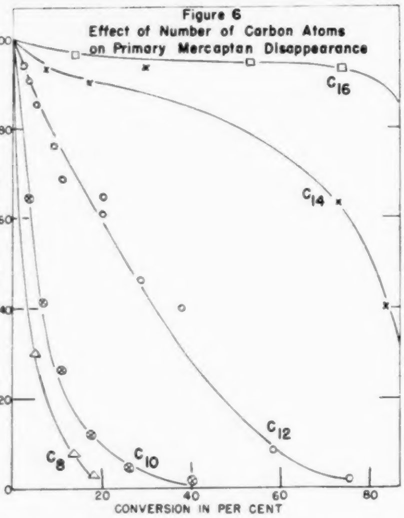


Figure 6
Effect of Number of Carbon Atoms on Primary Mercaptan Disappearance

ance with both primary and tertiary mercaptans is independent of the concentration of the mercaptan.

Modifiers which are consumed rapidly during the early stages of polymerization result in low molecular weight polymers with low intrinsic viscosity. At higher conversions little modification results from their use, and the polymers become insoluble. In the GR-S recipe with DDM the intrinsic viscosity increases to about 78%, after which the polymer becomes insoluble with a rapid decrease in intrinsic viscosity (Figure 8).

The effect of a number of variables on the rate of disappearance of primary and tertiary mercaptans in the GR-S recipe was studied, as is shown in Table 7.

TABLE 7. EFFECT OF DIFFERENT VARIABLES ON MERCAPTAN CONSUMPTION IN THE GR-S RECIPE

Variable	Primary Mercaptans	Tertiary Mercaptans
Rate of agitation	Increases with increased agitation	No effect
Soap	Increases with soap concentration	No effect
Excess alkali	Increases with excess alkali	No effect
$K_2S_2O_8$	Increases with concentration	No effect
Temperature	Increases with temperature	Increases with temperature
Dilution	Diluents increase consumption	No effect

In general, it may be said that in the GR-S recipe the consumption of primary mercaptans is influenced by rate of agitation, by soap concentration, by excess alkali,

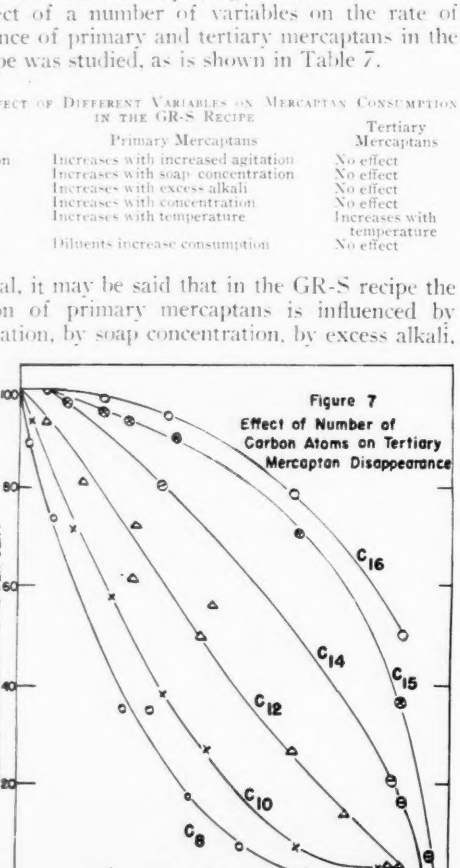


Figure 7
Effect of Number of Carbon Atoms on Tertiary Mercaptan Disappearance

by persulfate concentration, and by diluents, which have little or no effect on tertiary mercaptans. On the other hand temperature has the same effect on both primary and tertiary mercaptans; an increase in temperature increases the modifier consumption.

The type and the rate of agitation have a pronounced effect on rate of disappearance of primary mercaptans, but have little or no effect on the rate of disappearance of tertiary mercaptans (22, 23). The consumption of C_{12} tertiary mercaptans is independent of agitation. This can be explained by the fact that the rate of solubilization in soap solution of primary mercaptans is much smaller than that of tertiary mercaptans of the same molecular weight. With mild agitation, solubilization equilibrium is obtained or approached with tertiary C_{12} mercaptans, but is not attained with DDM.

At low conversions the amount of DDM consumed is greater with less than the normal amount (five parts) of soap, but at higher conversions the consumption is greater with the larger amount of soap (24). The rate of polymerization decreases with decreasing amounts of soap, giving greater time for mercaptan to reach solubilization equilibrium at low conversions, thus accounting for the greater consumption at low conversions with less than the normal amount of soap.

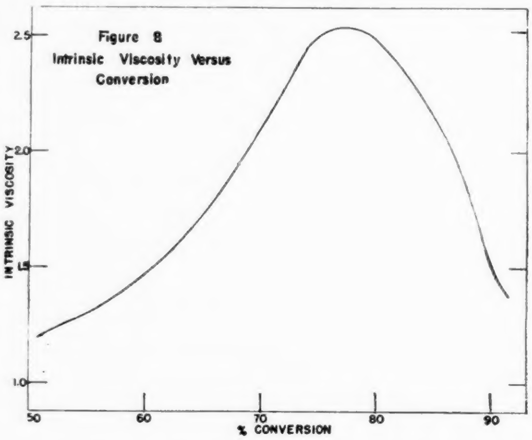


Figure 8
Intrinsic Viscosity Versus Conversion

Excess alkali above the neutralization equivalent causes an increase in modifier consumption with primary mercaptans (23, 25). This can be accounted for by the increased solubilization of the mercaptan and more rapid oxidation.

The rate of polymerization is not affected by the persulfate concentration, but in the case of primary mercaptans the rate of consumption is increased by increasing amounts of persulfate (26). Tertiary mercaptan disappearance in the GR-S recipe is not affected by persulfate concentration.

In one respect both primary and tertiary mercaptans behave the same. The rate of disappearance of the mercaptans increases with increasing temperature (18).

The modifier apparently functions both as a chain initiator and chain transfer agent (27). Both functions depend on the ease of oxidation of a particular mercaptan at the locus of reaction. In addition to the ease of oxidation, the amount of mercaptan consumed depends upon its concentration at the locus of reaction which is the soap micelles. This may depend on the solubility of the mercaptan in the soap, or later in the reaction on the solubility in the polymer-monomer particle. The diffusion rates of mercaptans, however, are generally low, and it seems questionable that mercaptan solubility equilibria are reached in emulsion polymerization.

Diffusion rate and oxidation rate are characteristics of each individual mercaptan and appear to be major factors in the polymerization reaction. These properties were studied for a number of mercaptans of different structure (28). The oxidation rates were measured in 5% soap with 3% persulfate with the solution buffered at pH 10. The diffusion rates were measured by the technique of Vinograd (as described before Division of Colloid Chemistry, A.C.S., September, 1944) in 10% potassium laurate at pH 10 and 30° C. The oxidation and diffusion rates for a number of mercaptans are shown in Table 8.

TABLE 8. RELATIVE RATES OF MERCAPTAN OXIDATION AND DIFFUSION

Mercaptan	Relative Oxidation Rates. Pure n-DD Mercaptan = 1.00	Relative Diffusion Rates. Pure n-DD Mercaptan = 1.00
n-Hexyl mercaptan	2.73	50.5
n-Octyl mercaptan	1.12	34.1
n-Decyl mercaptan	0.86	22.3
n-Dodecyl mercaptan (pure)	1.00	1.00
n-Dodecyl mercaptan (fraction from DDM)	0.93	1.08
4-n-Butyl-1-octyl mercaptan	0.77	2.54
n-Cetyl mercaptan	0.73	0.018
6-Dodecyl mercaptan	0.22	1.70
t-Butyl mercaptan	6.26	149.
t-Octyl mercaptan	0.11	34.0
t-Decyl mercaptan	0.037	12.9
t-Dodecyl mercaptan	0.058	5.1
di-n-Butyl-n-propylcarbinthiol	0.093	2.56
Dimethyl-n-nonylcarbinthiol	0.12	1.93
t-Tetradecyl mercaptan	0.046	1.70
t-Hexadecyl mercaptan	0.082	0.10

The diffusion rates of tertiary C_{12} and higher mercaptans are considerably higher than those of the corresponding straight-chain mercaptans. The diffusion rates appear to depend chiefly upon the amount of branching, however, and probably do not represent an inherent difference between primary and tertiary mercaptans. The dependence upon the amount of branching can be shown if the diffusion rates are compared with the longest straight-chain in the molecule, including the sulfur. This relation does not hold, however, for mercaptans C_{10} and shorter. n-Decyl mercaptan actually has a higher diffusion rate than does t-decyl mercaptan.

As already pointed out, pH has a profound effect on diffusion rates. Both primary and tertiary mercaptans diffuse at a greatly increased rate into completely neutralized soap solutions. Excess caustic over the amount necessary to neutralize the fatty acid also affects the rates, increasing the rates of the tertiary mercaptans slightly and of the primary mercaptans greatly.

The conclusion was reached by Reynolds (28) that the oxidation rate and diffusion rate of a mercaptan are of greater importance in characterizing it as a modifier than the solubility in soap. He doubts that solubilization equilibrium is ever reached under the conditions of most emulsion polymerizations. He used the product of oxidation rate and diffusion rate as a measure of modifier efficiency.

Mechanism of Modifier Action

TABLE 9. MECHANISM OF MODIFIER ACTION

(1). $2RSH + K_2S_2O_8 \longrightarrow 2RS\cdot + 2KHSO_4$

(2). $RS\cdot + C_6H_5CH{=}CH_2 \longrightarrow C_6H_5\dot{C}H{-}CH_2SR$

(3). $C_6H_5\dot{C}H{-}CH_2SR + CH_2{=}CH{-}CH{=}CH_2 \longrightarrow$

$$C_6H_5{-}\underset{\displaystyle CH_2SR}{\overset{\displaystyle H}{\underset{|}{\overset{|}{C}}}}{-}CH_2CH{=}CHCH_2\cdot$$

(4). $MCH_2\cdot + RSH \longrightarrow MCH_3 + RS\cdot$

The mercaptan modifier undoubtedly acts as a chain initiator and chain transfer agent in the GR-S recipe. A number of mechanisms to explain the action of the modifier has been postulated. The equations in Table 9 represent the mechanism most generally accepted.

A study of the modification of the polymerization of butadiene and styrene and the copolymerization of these monomers by n-dodecyl mercaptan indicates that the mercaptan acts through a free radical mechanism as a chain transfer agent, terminating the growth of one polymer chain and starting another. The evidence for this conclusion is as follows (27, 29).

1. Use of increasing amounts of dodecyl mercaptan in polymerizations progressively decreases the molecular weight of the polymers obtained. The percentage of sulfur present in these polymers progressively increases with the decrease in molecular weight.
2. Comparison of quantitative analyses and molecular weight measurements of the purified polymers showed one sulfur atom to be present per polymeric molecule.
3. Low molecular weight polystyrene and GR-S samples, prepared in the presence of lauryl mercaptan, were cleaved by hydrogenolysis over Raney nickel to yield n-dodecane. Low molecular weight polybutadiene was cleaved by chlorine and water to yield 1-dodecane sulfonyl chloride. These reactions prove the presence of the lauryl radical in the polymer chain.
4. Polymerizations were made with mercaptan modifiers containing a second functional group. In polymers prepared with thioglycolic acid and ethylthioglycolate as modifiers, the ratio of sulfur atoms to carboxyl or carbethoxyl groups was nearly 1:1. Comparison of sulfur analyses, neutral or saponification equivalents, and molecular weight measurements indicated that the polymers contained approximately one modifier residue per polymeric molecule.
5. Careful osmotic molecular weight measurements and sulfur analyses were carried out on commercial GR-S samples. The number of sulfur atoms present per polymeric molecule was found to be nearly unity.

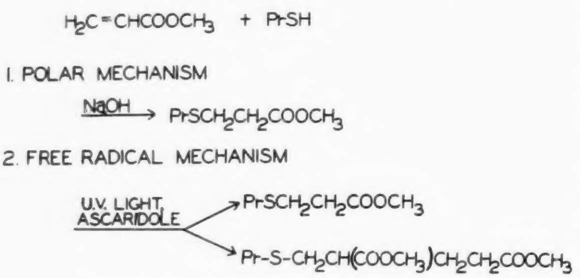
Kharasch (30) has produced abundant evidence that the copolymerization of butadiene and styrene proceeds by a free radical mechanism in which the mercaptan acts both as a chain initiator and chain breaker. Addition products of mercaptans, such as propyl and lauryl and thioglycollic acids have been isolated. Such additions have been carried out both in homogeneous solution and in emulsions. In the reactions in homogeneous solution (usually at 50° C.) equimolar quantities of a mercaptan and the hydrocarbon were used in the presence of about one mole per cent. of ascaridole. The reactions in emulsion were carried out with equimolar quantities of mercaptan and the hydrocarbon in the presence of soap, persulfate, and a buffer. Usually it was necessary to use about 25 mole per cent. (50 equivalent per cent. of persulfate in order to obtain a good yield of addition product. Irrespective of the mercaptan (propyl or lauryl) which was used, the results obtained in solution and emulsion were the same. The products isolated were as follows:

STYRENE AND RSH	BUTADIENE AND RSH
$C_6H_5CH_2CH_2SR$	$CH_3CH{=}CHCH_2SR$
AND	AND
$C_6H_5\underset{\displaystyle C_6H_5CH_2}{\underset{\displaystyle CH}{\underset{\vert}{C}}}HCH_2SR$	$CH_3CH{=}CHCH_2CH_2CH{=}CHCH_2SR$

In these formulae, R stands for either propyl or lauryl. The structures given for the products from butadiene do not mean that no 1,2-addition has taken place; they merely indicate the stoichiometric ratio of butadiene

to mercaptan. In this respect, they agree with the analyses of the respective compounds formed. The styrene derivatives were furthermore characterized by preparing from them the corresponding sulfones. It is important, however, that, besides the products listed above, there was obtained in every case a high boiling residue with a hydrocarbon to mercaptan ratio greater than two to one.

As additional evidence that the polymerization of the unsaturated compound takes place by a free radical mechanism, the interesting case of the addition of propyl mercaptan to methyl acrylate may be cited (31). Depending upon the conditions under which the reaction is carried out, the following products are obtained.



The striking fact is that the only product of addition by a polar mechanism is a compound formed by the union of one molecule of propyl mercaptan with one molecule of methyl acrylate; whereas, when the addition proceeds by a free radical mechanism, the products formed include not only a substance containing one molecule of methyl acrylate to one of mercaptan, but also a substance in which the molecular ratio of methyl acrylate to mercaptan is 3 to 1, 4 to 1, or even higher.

The reaction of styrene with thioglycollic acid has been shown to proceed only in the presence of an oxidant according to the following equation:

$$C_6H_5CH{=}CH_2 + HSCH_2COOH \rightarrow C_6H_5CH_2SCH_2COOH$$

A large amount of evidence now exists that addition reactions such as this which proceed contrary to the Markownikoff rule are chain reactions initiated by free radicals.

The inhibiting effect of oxygen on the addition of mercaptans to unsaturated compounds was shown (32). In emulsion, styrene and butadiene do not react with lauryl or other mercaptans when all the reagents are carefully purified and no catalyst is present. Small amounts of peroxides in the soap, styrene, or butadiene, however, are sufficient to cause rapid addition. Potassium persulfate catalyzes the addition reaction, but at high concentrations it also acts as an inhibiter. The inhibiting effect of oxygen on the addition of butadiene and styrene is shown in Table 10.

TABLE 10. INHIBITING EFFECT OF OXYGEN ON THE ADDITION OF LAURYL MERCAPTAN TO BUTADIENE AND TO STYRENE (3 HOURS AT 30°; POTASSIUM STEARATE EMULSION: 2 EQUIVALENT PER CENT. OF $K_2S_2O_8$)

	% Reaction	
	Vacuum	Air
Styrene	47	11
Butadiene	30	8

Oxygen also has an inhibiting effect on the copolymerization of butadiene and styrene, as is shown in Table 11 (32).

The rate of copolymerization, when the Mutual formula was used in *vacuo,* was arbitrarily chosen as 100. It is noteworthy that in *vacuo* the rate of copolymerization is only slightly affected by the persulfate concentration, also that the inhibiting effect in air is greater when the persulfate concentration is low. These facts are consistent with the assumption that persulfate is simultaneously a chain initiator and chain breaker. Since the oxygen and the persulfate compete for the chains, the oxygen is more effective when the persulfate concentration is lowest.

TABLE 11. EFFECT OF OXYGEN ON THE COPOLYMERIZATION OF BUTADIENE AND STYRENE

	Relative Rates	
Conc. of $K_2S_2O_8$	In Vacuo	In Oxygen
10 x mutual formula	90	70
Mutual formula	100	35
1/10 x mutual formula	115	15

Kolthoff has also shown (33) that oxygen acts as a typical inhibiter in the Mutual recipe with butadiene and styrene as comonomers. Also with butadiene and with styrene alone, oxygen causes an induction period which is proportional to the amount of oxygen present. After the induction period the polymerization proceeds with the normal rate. This effect of oxygen as a typical inhibitor is not found in all recipes.

It is significant that oxygen has no effect on the addition of lauryl mercaptan to butadiene and styrene when potassium ferricyanide is used as an activator with potassium persulfate (34) (Table 12).

TABLE 12. ADDITION OF LAURYL MERCAPTAN TO STYRENE IN THE PRESENCE OF $K_3Fe(CN)_6$

	% Reaction	
Conditions	Vacuum	Air
1 Equivalent per cent. $K_3Fe(CN)_6$, no $K_2S_2O_8$	39	11
1 Equivalent per cent. $K_3Fe(CN)_6$, 50 equivalent per cent. $K_2S_2O_8$	42	42
50 Equivalent per cent. $K_2S_2O_8$, no $K_3Fe(CN)_6$	28	16

Diazothioethers

In the course of the synthetic rubber program a large number of compounds was synthesized and tested as modifiers in the GR-S recipe (35). By far the greater number were mercaptans or mercaptan derivatives of various structural configurations. A new class of compounds which function both as catalysts and modifiers was developed, and these are the so-called diazothioethers prepared by diazotizing an aromatic amine or substituted amine and coupling with aromatic mercaptans (36). Four different types of compounds can be prepared, as is shown in Figure 9. Type 1 includes all of the oil-soluble examples, i.e., those having no solubilizing groups such as carboxylic or sulfonic. Type 2 has a solubilizing group on the "thio" component. Type 3 has a solubilizing group on the "diazo" component, and Type 4 has solubilizing groups on each component.

In Figure 10 a number of bases and mercaptans used in preparing diazothioethers are listed in the order of decreasing activities as catalysts. The diazothioethers containing activating substituents such as alkyl or alkoxyl in either the diazo part or the mercaptan part of the molecule are the most active initiators, and their solutions are the least stable; while those that contain deactivating substituents such as chloro or nitro are the least active initiators, and their solutions are much more stable.

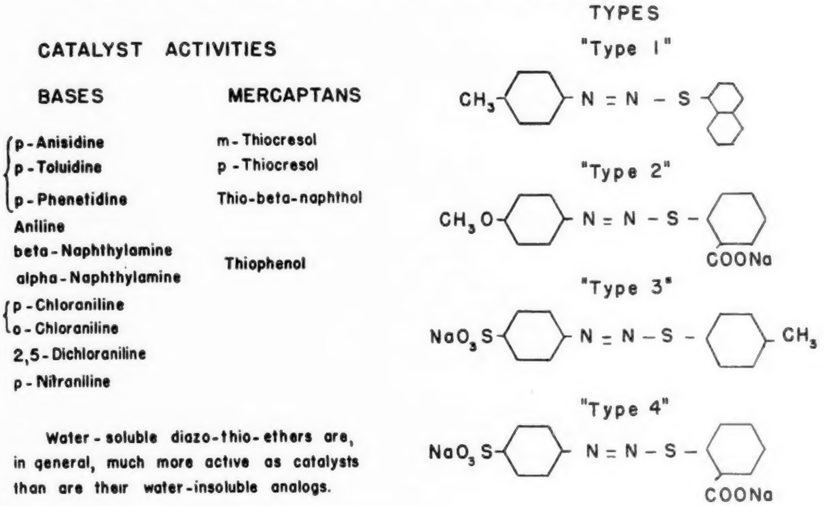
Diazothioethers containing solubilizing groups such as SO_3Na or COONa are less stable and decompose more rapidly in solution. Such catalysts have a high initial activity, but conversions are low. The presence of deactivating substituents is required to give them a lifetime sufficiently long for high conversions.

Activating substituents on the mercaptan part of the thioether also increase the activity of the catalyst. Thus the thiocresols are all more active than the thiophenols when the base used is either aniline or beta-naphthylamine.

A study of the decomposition rates of the diazothioethers, Table 13, shows the close correlation between

FIG 9

DIAZO THIOETHERS as CATALYSTS and MODIFIERS



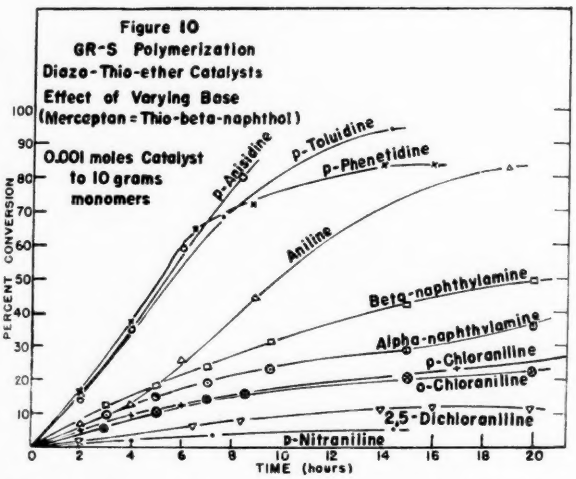
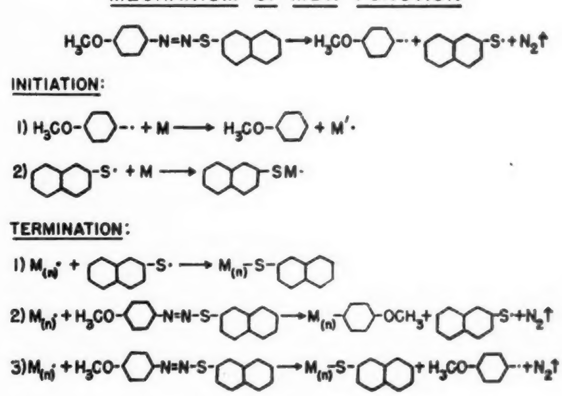


FIGURE II

MECHANISM OF MDN FUNCTION



relative decomposition rates, relative rates of polymerization and electronegativities of the bases from which the thioethers are prepared (*37*).

Table 13. Decomposition and Polymerization Rates of Diazothioethers Type—R-N-N-S-

R	Relative Decomposition Rate in HC Solvent Phenyl = 1	Relative Polymerization Rate Phenyl = 1
m-Xylyl	3.9	3.3
o-Tolyl	3.6	2.0
o-Anisyl	1.9	1.7
p-Tolyl	1.2	2.3
p-Anisyl	1.1	1.9
Phenyl	1.0	1.0
1-Naphthyl	0.9	0.6
2-Naphthyl	0.4	0.7
o-Chlorophenyl	0.5	0.2
p-Chlorophenyl	0.3	0.3
p-Nitrophenyl	0.2	0.1

Reynolds (*37*) has proposed a mechanism for the action of diazothioethers which is shown in Figure 11. According to this mechanism, the reaction can be initiated by either the alkyl radical or the mercaptan radical. In the case of the alkyl radical, initiation takes place by removal of a hydrogen atom from the monomer. The mercaptan radical, on the other hand, is presumed to add to the monomer forming a new free radical.

Chain termination can take place by addition of a mercaptyl radical to a growing chain or by reaction of the growing chain with the diazothioether in which either the alkyl or the mercaptyl radical adds to the chain, leaving the radical which has not added free to start new chains.

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(*Continued on page* 428)

EDITORIALS

Junior Achievement, Inc., Merits Industry Support

AMERICAN business, realizing some time ago that the trend in the world today is statism *versus* capitalism, organized in 1942 a project called Junior Achievement, Inc., to support and advance private enterprise through a program of youth education, junior achievement, or learning through doing. Junior Achievement, Inc., is a non-profit, non-political, non-partisan, and non-sectarian organization of businessmen dedicated to the purpose of educating American youth of 15 to 21 years of age in the "business system which built America" and eventually helping them become enlightened citizens and businessmen of the future.

As such, it certainly merits the support of the rubber and associated industries, and, in fact, already has the support of such men as J. A. MacMillan, Dayton Rubber Co.; F. C. Crawford, Thompson Products, Inc.; Harry L. Derby, American Cyanamid & Chemical Corp.; Larry C. Hart, Johns-Manville Corp.; Edgar M. Queeny, Monsanto Chemical Co.; Sumner Simpson, Raybestos-Manhattan, Inc.; Edmund S. Burke, Kelly Springfield Tire Co.; I. J. Harvey, Jr., Flintkote Co.; P. W. Litchfield, Goodyear Tire & Rubber Co.; A. W. Peake, Standard Oil Co. of Indiana; J. Howard Pew, Sun Oil Co.; and Clifford H. Ramsey, John Royle & Sons, to mention a few.

Junior Achievement, Inc., operates by the businessmen of the community bringing together a group of young people of high school age and aiding them to form an actual, though miniature business corporation to produce a product or sell a service. Adult advisers (in production, sales, and business procedure) from local business organizations advise and help these teen-agers to sell stock to finance their miniature corporation, buy supplies, produce, make money, and pay their stockholders dividends.

In each community where the program functions it is under the management of a local committee composed of representatives of management, labor, education, and civic affairs. The miniature corporations are formed in the high schools with the cooperation of local educators. The companies, meeting for one night a week over a period of two years, go through the entire life of a corporate business—from the creation of the original idea to the final liquidation of the business that was created from this idea.

At present 831 Junior Achievement companies have been formed employing 10,162 workers with 49,860 stockholders. Junior Achievement's goal for 1950 is 30,000 companies, 360,000 workers, and 1,800,000 stockholders. Companies have been organized in Massachusetts, Connecticut, Metropolitan New York, New Jersey, Georgia, Louisiana, Texas, Missouri, Ohio, Western Pennsylvania, Illinois, Wisconsin and Indiana. Companies are desired in Western New York State, Rhode Island, Eastern Pennsylvania, Michigan, Maryland-Delaware, Virginia-West Virginia, The Carolinas, Alabama, Florida, Kentucky-Tennessee, Minnesota, Colorado, California, and Washington-Oregon.

The many advantages to management, labor, the community, and the nation to be gained by participating in this youth project are almost too obvious to require enumeration. A better understanding of the relation between capital, management, and labor is gained, and experienced future employes are developed. The best way to preserve a free society in which there is a free labor is by having America's business system understood. In the community it brings business, labor, and educational influences together for constructive purposes, and in the nation it develops leadership in future men and women to occupy responsible posts in industry, labor, and professions. Last, but by no means least, it helps the youth of America to find out for themselves just what type of business career they are best qualified to follow and gives them some "know how" which will help them in the career of their choice.

Junior Achievement, Inc., is financed through voluntary subscriptions made by individuals, business firms, and philanthropic foundations. Such subscriptions are deductible for income tax purposes. We would like to urge all members of the rubber and associated industries to consider contributing some of their time and money to the support of this very worthwhile project during the coming year. It has been described as "the most effective single movement today for counteracting the 'anti-industry' attitude of so many people." The program has also been called "one of the smartest moves which could be made by businessmen who understand the importance of individual incentive under our economic system and the tremendous danger to our national standard of living which lies in our present trend away from free enterprise."

The headquarters of Junior Achievement, Inc., is 345 Madison Ave., New York 17, N. Y.

Holiday Greetings

IN VIEW of the coming of the Holiday Season, the staff of India RUBBER WORLD takes this occasion to wish all of its readers and friends a Very Merry Christmas and a Happy and Prosperous New Year.

Viewed in retrospect, the year 1947 has provided many reasons why the rubber industry should enjoy this Holiday Season to a somewhat greater extent than usual. Demand for its products has continued at record levels; raw materials, in general, have been adequate in supply and not too high in price; labor conditions have been quite good and seem likely to continue that way or even improve, and there is evidence that the problem of national policy on rubber will be defined more completely within the next month or two.

Plastics Technology

Low-Density Plastics

R. A. Clark[1], T. J. McCuistion[1]
and L. E. Cheyney[1]

THE expression, low-density plastics, is somewhat unusual and requires some explanation. In general, low-density plastics may be defined as those plastics which include considerable amounts of hollow spaces. These hollow spaces may be filled with some gas, often air, or may be vacuums. They may be interconnected or unconnected.

The general type of mechanical structure represented by low-density plastics is not particularly new although its application to this field is relatively so. These products are similar to many familiar materials such as sponge rubber, puffed wheat, low-density volcanic ash, low-density woods (balsa, cork), and natural sponge. Some mechanical types of low-density plastics are analogous to various reinforced structural materials used in many other ways and employing many other materials of construction.

The question might be asked, why make low-density plastics in the first place? There are several reasons:

(1) The lightness in weight of such construction results in economy of transportation and fabrication. Much less material is consumed in making an object of relatively the same volume.

(2) Products of this type may be made to have very high strength in relation to their density. This factor is usually expressed in terms of the so-called strength-weight ratio.

(3) Products of this type possess excellent stiffness as compared with other materials of equivalent weight.

(4) Some designs may be simplified by employing these low-density materials.

(5) Fabrication is sometimes relatively easy as compared with methods required for high-density plastics.

(6) These materials are usually thermally self-insulating.

General Types

There are two general classifications of low-density plastic types of construction: (1) unsupported type; and (2) supported or mechanically reinforced type.

The unsupported type of low-density material consists of a cellular plastic containing small gas cells formed by one of several methods. The supported type of construction consists in general of one or two sheets or facings of high-density material fastened or adhered to a core material. When two facings are used, the construction is usually referred to as "sandwich" construction. Sandwich constructions may also be made with low-density core materials other than cellular plastics, but the purpose of the construction is the same, i.e., stabilizing the mechanical structure by transmitting loads and distributing them over a wide area. A third material is usually present, the adhesive which holds the filler or core in intimate contact with the facing.

In addition to the cellular plastics employed as core materials in the sandwich

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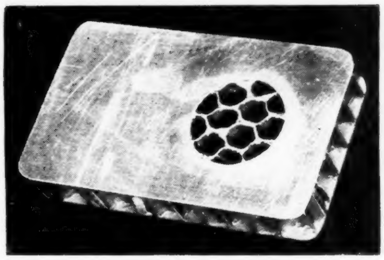

Fig. 1. Typical Honeycomb Construction

type of construction, various mechanical types of low-density construction may also be employed. A promising example of this type is that known as "honeycomb" (see Figure 1). Somewhat intermediate between cellular materials and mechanically reinforced types are products such as cellulose sponge, which are formed by leaching out a soluble solid with a solvent. Another type is exemplified by the product known as Foamboard, which consists of an aggregation of fibers held loosely together by a binder.

Methods of Preparing Cellular Materials

Any resinous material may be employed in the manufacture of a cellular product, although only a few have achieved commercial significance. The general principle involved is the formation of cells by one of several methods. This formation is carried out by the process known as blowing and involves three distinct steps: (1) adjustment of plasticity; (2) provision for expansion; and (3) solidification of the expanded materials. Several methods of blowing are employed: (1) the material may be frothed by beating air into the mix and solidified in this form; (2) the blow may be carried out internally by chemical decomposition, by using an auxiliary material known as a blowing agent, or in some cases by decomposition of a part of the resin itself.

Blown plastic materials are, of course, compounded before the blowing operation takes place. The composition may contain several different types of materials, including resin, plasticizer, blowing agent, catalyst, reinforcing agent, and various miscellaneous materials. Figure 2 illustrates several types of cellular plastics.

The equipment requirements for preparing blown plastics are of some interest. Mixing equipment is necessary for the preliminary phases of preparing the material; the exact type depends upon the method of preparation. Molds for preparation of the final product are usually necessary. Equipment for expanding the material is a requirement in some cases and may consist of an expanding mold or other necessary types. Extruding and forming equipment is needed in many cases.

The leaching technique has been employed in a preparation of the well-known cellulose sponge used in photography and in many domestic applications. Other low-density products may be prepared by entirely analogous procedures. For example, starch has been incorporated into resinous compositions and then dissolved out after the desired object has been formed. In other cases acid-reactive pigments may be incorporated into acid-resistant resins and then removed by acid treatment to create a low-density product. An interesting type of sponge structure is that formed by the action of organisms, such as yeast, which give rise to gaseous by-products, thus creating a structure which may be somewhat cellular in character. This technique has been employed in the baking industry.

The low-density type of material known as Foamboard is illustrative of a general class formed by matting together fibrous materials into a loose, porous structure, followed by the inclusion of sufficient binder to hold the fibrous structure in place. Another type of low-density product, originally developed in the rubber industry, was formed by blowing fine jets of air through a sheet of the material while still in a plastic condition. A mechanical analog of this method is made by punching or drilling large numbers of holes through a sheet material. The possibilities inherent in such types of construction are quite numerous.

Honeycomb Construction

The honeycomb type of construction is essentially similar to that of corrugated paper boxes. Various sheeting materials may be employed in forming the walls of the honeycomb cells. For example, resin-impregnated paper has been used, as have various resin-impregnated fabrics such as

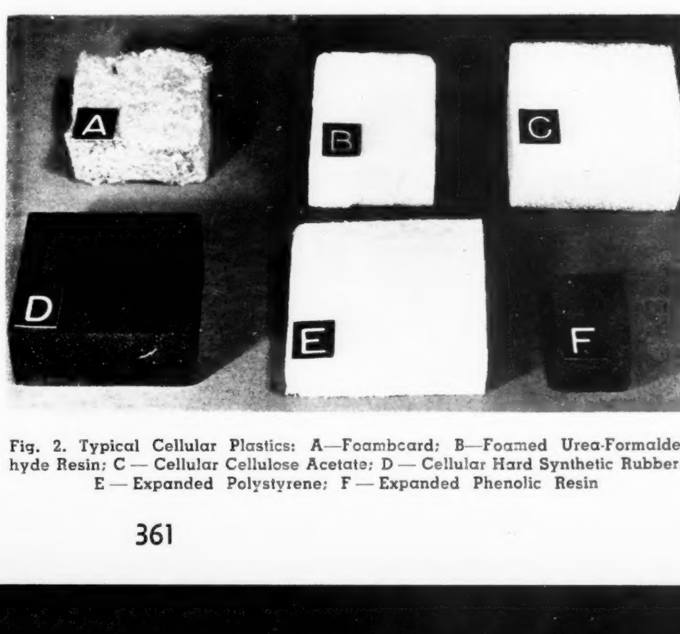

Fig. 2. Typical Cellular Plastics: A—Foamboard; B—Foamed Urea-Formaldehyde Resin; C — Cellular Cellulose Acetate; D — Cellular Hard Synthetic Rubber; E — Expanded Polystyrene; F — Expanded Phenolic Resin

TABLE 1. COMPRESSIVE PROPERTIES OF SOME LOW-DENSITY MATERIALS

Material	Density, Lbs./Cu. Ft.	Strength P.S.I.	Modulus, P.S.I.	Yield Stress, P.S.I.	Remarks
Balsa (end-grain)	7-11	....	68,000-138,000	500-950	Directional
Cellular cellulose acetate	4-6	75-300	1,600	10-20	Slightly directional; water sensitive
Expanded hard rubber	5-10	250	15,000-20,000	125-150	Dark color
Expanded polystyrene	2-7	35-200	1,000	....	Thermoplastic
Expanded phenolic resin	2-20	30-100	4,000	....	....
Expanded urea-formaldehyde resin	1-2	Very low	....	....	Water sensitive
Expanded polyvinyl chloride	7	200	....	....	Thermoplastic

TABLE 2. THERMAL CONDUCTIVITIES OF SOME LOW-DENSITY MATERIALS

Material	Density Lbs./Cu. Ft.	"K" Factor
Still air	0.08	0.157
Cork	5	0.25
Rock wool	9	0.28
Vermiculite (expanded mica)	6	0.45
Cellular cellulose acetate	4	0.30
Expanded polystyrene	2	0.25
Cellular hard rubber	5	0.20
Foamed urea-formaldehyde	1	0.25
Fiberglas Superfines	0.7	0.26
Foamboard	1	0.30
Cattail fibers	1	0.32

glass, rayon, etc. Another type, which has been likened to an expanded paper Christmas bell in its method of preparation and general characteristics, employs resin for bonding the paper only at the peaks of the corrugation. In this product, the adhesive represents only 3-5% of the total weight. An analogous product has been formed experimentally from wood veneer by bonding at intervals and then forming the sheet softened by steaming.

Continuous methods have been developed for the manufacture of the honeycomb type of construction. Several of these methods are now in the pilot-plant stage, and it is reasonable to assume that this type of construction will appear on the market soon in much larger quantities.

A similar type of mechanically reinforced product may be prepared by forming a combination of resin and sheet material around removable inserts. Rubber tubes have been used successfully as inserts for this purpose. They have the advantage of flexibility so that the space caused by their removal may be curved. More recently, Scogland[2] has employed sand-filled cellophane tubes for the same purpose. Other materials may be employed similarly. Another technique under study is the formation of a mechanically reinforced sandwich using hollow glass-fiber tubing as the low-density material.

Mechanical Properties

Compressive properties are most important and therefore of most interest in connection with the sandwich type of construction. Its most pronounced mechanical advantage is the reduction of failures caused by buckling, sometimes called "oil canning." Compressive strength, compressive modulus, and compressive yield strength are important properties, and all of these vary within some limits for the commercially important materials. Some examples are shown in Table 1.

Balsa wood is an unusual material which has been employed as a successful core in sandwich construction, especially for aircraft applications. The compressive properties of this material show a directional effect, and it must usually be employed in the end-grain condition to achieve maximum results. Only one of the commercial cellular products, cellular cellulose acetate, shows a grain effect.

The effects of temperature are most pronounced on the properties of thermoplastic materials such as expanded vinyls and polystyrene. The coefficient of expansion of the enclosed gas may be a serious factor in determining the effects of temperature on the properties of the closed-cell type of low-density material. The relative expansion of core and adhesive is a net property of a sandwich construction which determines its ability to maintain its character over wide temperature ranges. Humidity is also an important factor in determining the properties of many of these low-density products, especially with the foamed urea-formaldehyde resins, the low-density woods, the polyamide resins, and others. Mechanical properties vary considerably with the density, as might be expected. For many materials the variation is logarithmic in character, although it may be essentially linear over limited density ranges.

Thermal Properties

Most of the low-density materials are good thermal insulators since they tend to entrap still air. Thermal conductivity is normally expressed in terms of the "K" factor, which is defined in the English system as B.t.u./hr./sq. ft./°F. in. This is an absolute quantity, but it is usually referred to the corresponding value for still air as a standard. Table 2 shows a few typical values of the K factor for some low-density plastics and some other commonly used insulating materials. It should be noted that the thermal conductivity of the low-density materials varies with the density, since the relative proportions of air (or gas) and resin may vary.

Accoustical Properties

A few of the low-density plastic materials are good accoustical insulators. The open-cell type of cellular product is superior to the closed-cell type in this respect. Accoustical properties are usually expressed in terms of sound absorption at various frequencies; the value is reported as a decimal fraction.

Various ceramic sound-insulating sheets available commercially have sound absorption coefficients as high as 0.80 at certain frequencies. Hair felt, another popular material, has a sound coefficient as high as 0.84. A low-density type of glass fiber known as Fiberglas Superfines is reported to have an absorption coefficient for some frequencies as high as 0.99. The best cellular plastic in this respect is foamed urea-formaldehyde resin which has a coefficient of 0.76 at certain frequencies. The coefficient varies with the density and thickness of the specimen.

Uses and Applications

Low-density plastics were first employed extensively in aircraft construction. These applications may be classified under four general groups: (1) primary structural applications, such as fuselage, wing, and stabilizer structures; (2) cellular material used to fill certain types of hollow propellers; (3) secondary structural applications, such as flooring, doors, and bulkheads; and (4) non-structural applications, as decorative fixtures, insulation, service counters, and flotation materials.

Automotive applications include siding and flooring for trailers and trucks, and similar applications as well as doors in passenger automobiles. Most of these applications are still in the development stage, but it is reasonable to assume that some of them will become commercially significant, especially in trucks and buses where its high strength-weight ratio and insulating value make this type of construction extremely interesting.

Another potential application which has not yet been exploited to any degree is that of refrigerator car construction, where the same properties make the material seem quite promising. By maintaining the same degree of stiffness and increasing the insulating value of the walls by use of sandwich construction, a refrigerator car can be transported for longer distances without re-icing, a larger pay load of perishable material may be included in the car, or the same load may be hauled with less fuel consumption. In any event the economic savings should be significant.

The sandwich type of construction shows much promise for building applications because of: (1) ease of fabrication; (2) possibilities for prefabrication; (3) savings in materials; (4) decorative possibilities; and (5) insulating value. Doors with low-density centers are now being manufactured. It is reasonable to assume that other applications will result in the near future, such as in cabinets, walls, ceilings, and elevators. It is interesting to speculate on the possible savings in power if an elevator floor were of sandwich material.

Applications of this type of construction to the general building field are not without any problems. For example, walls cannot simply be nailed together as can the conventional wooden ones. Considerable study has been given to fabrication problems of this type. Bolts can be used successfully in mounting large assemblies, but even these must be carefully selected, and specific techniques used in their application. Rivets of special types have also been developed for use in such applications.

It is reasonable to expect that much heavy furniture now constructed of wood or metal may in the future be replaced by lighter material employing the technique of sandwich construction. Aside from the savings in weight, considerable savings in cost should result from the simplicity of techniques possible with the sandwich materials. It is more than likely that we shall see tables, desks, and beds, for example, employing such types of materials in their construction. Other types of furniture may employ the mechanically reinforced types of low-density plastics in various internal supporting structures.

It is believed that some of the low-density materials may lend themselves to applications in the packaging field because of their insulating value, light weight, and outstanding ability to protect against the effects of mechanical shock. It is quite within the realm of possibility to visualize the shipment of rare tropical fruits and vegetables, medicines, serums, flowers, seafood, and other perishable or fragile materials by means of insulated or reinforced packages or cartons employing cellular materials or sandwich-type construction for the particular applications required.

[2] *Plastics (Chicago)*, July, 1945, p. 74.

Plastics Product Design

ROBERT L. DAVIS, of Fabri-Form Co., was guest speaker at a dinner-meeting of the Central Ohio Section, Society of Plastics Engineers, on October 17 at the Berwick Hotel, Cambridge, O. Speaking on "Product Design with Plastics," Mr. Davis discussed the selection of plastics materials, the design of molds, both simple and transfer types, and design of dies for extrusion, and the drawing of sheet materials. The talk, illustrated by samples of molded parts, covered early all the pitfalls encountered by the plastics fabricator and indicated many methods of eliminating or correcting these difficulties.

The Section's prize papers contest was discussed at the business session. This contest is open to both S.P.E. members and non-members under 30 years of age. Winning papers are to be presented at the Society's national meeting in Detroit, Mich., on January 21 and 22.

The Section's next meeting was held on November 14 at the Granville Inn, Granville, O. Some 24 members and guests attended the meeting which featured a discussion of professional engineering activities in the plastics field, conducted by J. G. Wilson, vice president of the Miami Valley Section, S.P.E., and W. L. Hess, national vice chairman of the S.P.E. professional activities committee. The speakers led a round-table discussion on the place of the local sections in the committee, and it was decided that the Central Ohio group would fit most naturally into the chemical investigation committee. It was also agreed that local sections should, in general, act as "starters" by furnishing the logical personnel to participate in the national program.

The next meeting of the Central Ohio Section is scheduled for December 12 at the Lancaster Country Club, Lancaster, O. Speaker of the evening will be Thomas E. Orr, S.P.E. national president, who will talk on "The National Organization and Its Activities." Also on the agenda is the annual business meeting including elections of Section officers for the coming year. A motion picture, "Tenite," by the Tennessee Eastman Corp., is also to be presented.

S.P.E. Rochester Section Meetings

SOME 53 members and guests of the Rochester, N. Y. Section, Society of Plastics Engineers, attended a dinner-meeting on November 18 at the Hotel Rochester. Islyn Thomas, of Thomas Mfg. Co., spoke on "Mold Design, Hobbing and Its Limitations," assisted by John Spitzing, of Newark Tool & Die Co. Mr. Thomas discussed the origin and development of hobbing as a method of making plastics molds. Using slide illustrations, the speaker discussed hobbing procedure, hobbing presses, rings, and blanks, the various operations involved, and design fundamentals of hobs and cavities. Mr. Thomas also gave some interesting sidelights on materials procurement, designer's viewpoints, and general molding standards. Following the talk, the speaker, assisted by Mr. Spitzing, conducted a discussion period to answer questions from the floor. Following the technical session, a short business meeting was held to hear the report of the chairman of the section's membership committee, Vernon Whitman. The section's next meeting will be held on December 16 at Lorenzo's Restaurant, in Rochester, and the name of the speaker will be announced at a later date.

The preceding meeting of the Rochester Section was held on October 21 at the Hotel Rochester, attended by 35 members and guests. The feature of the meeting was a panel discussion of various plastics problems encountered by members in the area. The panel consisted of Messrs. Palmer, Manning, Spitznagel, Harry Steele, and Gerald De Lair, all members of the section. Six problems were presented from the floor, with panel members first giving their opinions and the problems then being thrown open to the group for general discussion. At the business meeting, section Chairman Howe introduced the chairmen of the section's various committees, as follows: membership, Vernon Whitman; credential, Frederick Ciambrone; nominating, Chester Crumrine; finance, Richard Hayes; auditing, William Manning; program, Eugene Cathcart; house, Joseph Windheim; and publicity, Charles Williams. Each committee chairman in turn introduced the various members of his committee. Following adjournment of the regular meeting, a short meeting of the Section's board of directors was held. Charles Kolstad was elected inspector of elections, and Gene Cathcart, Gerald De Lair, and George Peck were elected delegates to the S.P.E. national council. Harry Steele and Henry Kauth were elected judges of the contest which the Rochester Section will hold in conjunction with the S.P.E. Buffalo Section, which will also elect two judges.

Discuss Trends in Molding Thermosetting Plastics

THE Eastern New England Section of the Society of Plastics Engineers held a dinner-meeting on October 30 at the Hotel Puritan, Boston, Mass. Some 31 members and guests attended the meeting, which featured a talk on "Present Trends in Molding of Thermosetting Plastics and Their Probable Consequences," by H. M. Richardson, of DeBell & Richardson, Inc., Springfield, Mass.

It appears to be generally recognized, the speaker said, that a revolution is in progress in the methods of molding thermosetting plastics which is likely to make a fundamental change in the character of this industry. The cause of this revolution is the common availability of high-frequency dielectric preheating for thermosetting molding compounds, plus the general adoption of high-speed methods of transfer molding. Prior to this time, thermosetting plastics were either compression or transfer molded on relatively slow cycles. Curing time ranged from one minute to 15 minutes, depending on the shape and the size of the piece, and a considerable amount of skill was required of the press operator to obtain suitable quality and uniformity of the molded parts. Conduction methods of preheating were used which were relatively inefficient, and the method often required finishing operations that were quite costly.

During the present transition period, as the result of high-frequency preheating or the use of dry steam as a heat transfer medium, a compound can be brought to the plastic state before it is placed into the mold and may therefore be immediately flowed into place and cured rapidly. The net effect of this method is to minimize the necessary curing time and make it almost independent of the thickness of the molded part. This point is particularly true where transfer molding is used. By reducing the curing time it has been possible to increase the output per mold cavity by 100 to 300%. This method also gives a uniformly thin or non-existent flash, uniform dimensions, good appearance, and reduced finishing costs.

Most of the advantages of these new methods have been gained until now by the use of existing hydraulic press equipment. The principal opportunity for further reduction in molding cycle time now lies in speeding up the operation of the press, Mr. Richardson declared. To make most efficient use of the operator's time a more general adoption of automatic cycle control is also indicated.

With automatic controls, suitable high-speed press equipment, and modern preheating and molding methods available, there has been a trend for companies which use plastics to manufacture their own parts instead of purchasing them from custom molders. In order to compete with this trend the custom molder must have equipment and methods fully as fast and as efficient as those available to the former consumer companies. There are still ample opportunities for the exercise of skill and enterprise on the part of the custom molders, the speaker said. Their background of experience and knowledge can find expression in the proper and economical design of molded parts. By the use of mold design for maximum output, minimum liability for maintenance, automatic fixtures for core pulling and other operations, proper choice of plastic materials, suitable heating, and rapid molding methods, the custom molder can achieve full and uninterrupted production of uniform and high-quality parts. In this field the custom molder can find ample and profitable opportunities for service.

The next meeting of the Eastern New England Section took place on November 20 at the Hotel Puritan, Boston. Speaker of the evening was Frank A. Rideout, of Bakelite Corp., whose subject was "Vinyl Resins Grow Up." The talk, which was of a general nature, began with a review of the nature of vinyl resins. Mr. Rideout noted that industrially these plastics have grown from their first commercial production in 1928 to a rate that will be well over 200,000,000 pounds annually by the end of 1948. This increased production has been matched by a steady reduction in price. Vinyl resins have been widely accepted and used, and various forms and modifications have been created and developed to insure their continued acceptance and to widen their fields of application. New resins and new techniques in handling vinyls promise a growing future for these plastics.

Phenolic Plastics Discussed

THE Rhode Island and Southeast Massachusetts Section of the Society of Plastics Engineers held its first meeting of the current season on October 8 at the Providence Engineering Society Bldg., Providence, R. I. Speaker of the evening was Edward F. Burro, of Durez Plastics & Chemicals, Inc., on the subject of phenolic plastics.

Using illustrations, Mr. Burro discussed the physical and electrical properties of several phenolic molding materials under various moisture conditions. He empha-

sized that one cannot coordinate all properties for a given application. The selection of the proper material for any application is generally a real problem, the speaker declared, because of the hundreds of different materials available in the plastics industry. Selections are often made in haste and result in misapplication that can be responsible for retarding the progress of the industry and necessitate a long reeducational period for the consumer.

Phenolics, like other materials, behave differently under varying conditions, Mr. Burro pointed out. It would be impossible to incorporate all the superior properties in one phenolic to meet all these conditions. Hence various phenolics with specific properties are produced. When the use of plastics for a new application is being considered, each function of the proposed part must be thoroughly investigated. Proper selection will still depend on the available information concerning the material's reactions under various conditions.

The Section held its second meeting of the season on November 12, with some 50 members attending. Feature of this session was a talk by Islyn Thomas of Thomas Mfg. Co., assisted by Edmund Spitzing, of Newark Tool & Die Co., on "Molding Design and the Importance of Die Hobbing." The talk was similar to that given by Messrs. Thomas and Spitzing at the November 18 meeting of the Rochester Section, Society of Plastics Engineers (see page 363.)

AMERICAN CYANAMID CO., Plastics Division, Rockefeller Plaza, New York, N. Y., in conjunction with Formica Insulation Co., Cincinnati, O., and James McCreery & Co., New York, held a press party on November 21 at McCreery's "Big Top" children's resturant to demonstrate a unique application of laminated plastic materials. The restaurant has a circus motif and formerly used metal trays with printed paper place mats carrying replicas of old-time circus handbills. These have now been discarded, and in their place are tables having laminated plastic tops in which the place mats are an integral part of the table surface. The table tops were laminated by Formica from layers of paper impregnated with American Cyanamid's Melmac resin, a melamine-formaldehyde type. The new table tops have improved appearance, have eliminated the high cost of replacing the paper place mats, and have added to the ease with which sanitary and efficient serving conditions may be maintained.

New Formaldehyde Unit

CONSTRUCTION of a new unit to produce formaldehyde for expanded output of plastic resins was recently announced by the plastics division, Monsanto Chemical Co., Springfield, Mass. Ground has been broken for the new unit at Springfield, and construction is expected to be completed in the second quarter of 1948.

Formaldehyde is one of the two important ingredients in phenolic and melamine thermosetting plastic resins. The new plant, added to the newly constructed wood flour plant at Springfield, the company's phenol plant at East St. Louis, Ill., and the melamine plant at Everett, Mass., will make Monsanto's plastics division independent of outside basic chemical sources for components of these two resins, produced under the trade names, Resinox and Resimene.

The process to be used in the manufacture was developed at Monsanto's central research department, Dayton, O. James S. Butler, active in the development there, is being transferred to Springfield to take charge of the new unit. After graduating from Ohio Wesleyan University in 1935, Mr. Butler was employed as a chemist by the Thomas & Hochwalt Laboratories, forerunners of Monsanto's central research department. During the past several years he has been engaged in pilot-plant chemical engineering in the fields of alkylation formaldehyde, dehydrogenation, sulfonation, and vinylation.

Kriston Resin Bonding

DEVELOPMENT work pioneered by Ekco Products Co. has led to improved products and manufacturing techniques in the cutlery industry. Kriston resin has proved an economical and practical replacement for litharge-glycerine cement used for more than a century to bond handles to knife blades, forks, and sharpeners. Its low shrinkage during cure makes Kriston resin, a product of B. F. Goodrich Chemical Co., Rose Bldg., Cleveland, O., unique in the field of thermosetting resins for this application. It provides a bond three times stronger than that of litharge-glycerine. When a litharge-glycerine bond is broken, the cutlery handles can be removed without additional force; whereas with Kriston a 100-pound pull is necessary to separate the elements even after the bond is ruptured. In addition, Kriston is much easier and cleaner handling than litharge-glycerine, has no sensitivity to humidity, and is highly resistant to boiling water and food acids. Kriston resin has been found satisfactory for bonding many types of handles to metal, including wood, glass, bone, and phenol-formaldehyde resin.

Color Standard for Urea Plastics

A COMMERCIAL standard for colors for molded urea plastics has been announced jointly by the Plastic Materials Manufacturers Association, Inc., and the Commodity Standards Division of the National Bureau of Standards. The new standard, designated CS147-47 and effective December 15, concludes a two-year program of cooperation between the industry and the Bureau in establishing the list of 17 colors as now adopted. The 17 colors covered by the standard are those most widely used, although other colors can be supplied by material manufacturers upon order. The standard defines the colors in reproducible terms, specifies tolerances, and provides for standard samples and designations to be used by all segments of the industry. Standard samples of the colors are available from the Plastic Materials Manufacturers Association, Room 731, Tower Bldg., Washington 5, D. C., in complete sets of 17 colors at $2.50 a set, remittance to accompany order.

CALENDAR

Dec. 1-6.	Twenty-First Exposition of Chemical Industries. Grand Central Palace, New York, N. Y.
Dec. 2.	The Los Angeles Rubber Group, Inc. Christmas Party. Hotel Mayfair, Los Angeles, Calif.
Dec. 2-5.	American Society of Mechanical Engineers. Annual Meeting. Atlantic City, N. J.
Dec. 5.	Philadelphia Rubber Group. Kugler's Restaurant, Philadelphia, Pa.
Dec. 8.	Northern California Rubber Group. Christmas Party.
Dec. 8-13.	Annual Automotive Service Industries Show. Navy Pier, Chicago, Ill.
Dec. 9.	Buffalo Rubber Group. Christmas Party.
Dec. 12.	Boston Rubber Group. Christmas Party. Hotel Somerset, Boston, Mass.
Dec. 12.	New York Rubber Group. Christmas Party. Hotel McAlpin, New York, N. Y.
Dec. 12.	Detroit Rubber & Plastics Group, Inc. Annual Christmas Party. Detroit-Leland Hotel, Detroit, Mich.
Dec. 15-16.	American Management Association. National Conference, Hotel Pennsylvania, New York, N. Y.
Dec. 16.	Rochester Section, Society of Plastics Engineers. Lorenzo's Restaurant, Rochester, N. Y.
Dec. 18.	Southern Ohio Rubber Group. Christmas Party. Miami Valley Country Club, Dayton, O.
Dec. 18.	Quebec Rubber & Plastics Group. Ritz Carlton Hotel, Montreal, P. Q., Canada.
Dec. 19.	Chicago Rubber Group. Christmas Party. Morrison Hotel, Chicago, Ill.
Jan. 8.	Quebec Rubber & Plastics Group. Ritz Carlton Hotel, Montreal, P. Q., Canada.
Jan. 9.	Chicago Section, S.P.E. Annual Party. Edgewater Beach Hotel, Chicago, Ill.
Jan. 12-16.	Society of Automotive Engineers. Annual Meeting. Book-Cadillac Hotel, Detroit, Mich.
Jan. 12-16.	Second National Materials Handling Exposition. Public Auditorium, Cleveland, O.
Jan. 19-23.	Bicycle Institute of America. Annual Convention. Flamingo Hotel, Miami Beach, Fla.
Jan. 20.	Rochester Section, S.P.E.
Feb. 1-6.	National Sporting Goods Association. 1948 Convention. Hotel New Yorker, New York, N. Y.
Feb. 3.	Los Angeles Rubber Group, Inc. Hotel Mayfair, Los Angeles, Calif.
Feb. 6.	Akron Rubber Group
Feb. 6.	Chicago Rubber Group. Morrison Hotel, Chicago, Ill.
Feb. 13.	Connecticut Rubber Group.
Mar. 1-6.	A.S.T.M. Committee Week. Washington, D. C.
Mar. 17.	Boston Rubber Group. Spring Meeting. Somerset Hotel, Boston, Mass.
Apr. 19-23.	American Chemical Society Spring Meeting. Chicago, Ill.

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Scientific and Technical Activities

Program of High Polymer Division, A.P.S., Meeting at Chicago This Month

THE 1947 regular meeting of the Division of High Polymer Physics, American Physical Society, will be held in Chicago, Ill., jointly with the meeting of the A.P.S. and the American Association for the Advancement of Science, on December 29 to 31, 1947. The headquarters hotel for the Division will be the Palmer House, and the Division program is scheduled for December 29. Abstracts are given below of papers to be presented before the Division that are of direct or indirect interest to the rubber industry.

Depolarization of Light Scattered by Macromolecular Solutions. The light scattered transversely from a solution through which a parallel beam of monochromatic, polarized light passes can be readily resolved into vertically and horizontally polarized components. When the incident light is vertically polarized, these components in the scattered light are designated as V_v and H_v; when it is horizontally polarized, the components are denoted by V_h and H_h, respectively. A qualitative theory is presented which predicts the variation of these four components with such variables as molecular weight, concentration, molecular size, solvent-solute interaction, and ionic charge. These details are discussed separately for flexible and rigid molecules. The results for the different components can be combined to predict the behavior of the conventionally measured depolarization ratios: $\rho_v = (H_v/V_v)$ and $\rho_h = (V_h/H_h)$. It is clear that less ambiguous interpretations of data are possible if the absolute values of the individual components are measured rather than the ratios as heretofore. The calculation of macromolecular dimensions by measuring depolarization ratios is discussed, and several important errors in the literature are corrected. Some measurements on polymer solutions and tobacco mosaic virus solutions under different conditions are presented and interpreted in terms of the theory. In particular, a correlation of orientation in the contacts of polymer segments is noted, and a precise test of the calculation of dimensions of rod-like molecules from depolarization measurements indicates the essentially qualitative nature of this relation. Paul Doty,[1] Royal Institute, London, England, and S. J. Stein, Polytechnic Institute of Brooklyn, Brooklyn, N. Y.

Adsorption Analysis of High Molecular Substances. Some preliminary experiments have been carried out to investigate the possibilities of using adsorption analysis in the study of high polymeric substances. The experimental arrangements for adsorption analysis developed by Tiselius, and one of the present authors will be described. So far the so-called "frontal analysis" has been used. This means that the solution is forced through a column with adsorbent, and the concentration of the effluent is followed continuously with a micro-interference refractometer. Activated charcoal has been used as adsorbent. It has been possible to show the occurrence of different discrete fractions in nitrocelluloses, polyvinyl acetates, and synthetic rubbers. The fractions do not differ in molecular weight only as they do not show up as separate boundaries when the original rather polydispersed solution is ultracentrifuged. The fractions from the adsorption analysis are less polydispersed than the original solution. From a separate study it has been found that the amount adsorbed decreases with increasing molecular weight of the high polymeric substances, and the same is true for the rate of adsorption (diffusion effect) which is rather slow. Both these effects will cause the higher molecular species to occur in the first fractions, making it possible to fractionate high polymeric substances according to molecular weight. The separation factor is, however, not large enough to account for the occurrence of the discrete fractions mentioned earlier. Thus it appears that adsorption analysis makes it possible to fractionate high polymeric substances both according to molecular weight and to other variables. Ingrid and Stig Claesson.

Elasto-Viscous Properties of Polyisobutylene. I. Relaxation of Stress in Whole Polymer of Different Molecular Weights at Elevated Temperatures. The relaxation of stress in stretched samples of polyisobutylene whole polymer of different average molecular weights has been investigated over the temperature range 30-100° C. and at different elongations. The relaxation curve for a given molecular weight has the same shape at different temperatures, when plotted as "reduced stress" *vs.* logarithmic time, and differs only in position along the time scale at the different temperatures. An activation energy for relaxation may be calculated by use of the Arrhenius equation; the activation energies for the different molecular weights are found to be identical within the accuracy of determination; the average value obtained is 15.4 kcals. The shape of the relaxation curve is independent of elongation up to approximately 70% elongation; beyond this value the shape of the curve changes progressively with elongation in such a way that the relative decrease in stress between any two arbitrary time values increases with increasing elongation. The shape of the relaxation curve does not correspond to exponential, hyperbolic tangent, or exponential integral relaxation functions; the experimental points are fit best empirically by the equation of a hyperbola. Straight lines are obtained if reciprocal viscosity average molecular weight is plotted against the logarithm of the time at which the reduced stress has a certain arbitrary value, at a fixed temperature. Relaxation rate depends on molecular weight with sufficient sensitivity so that relaxation of stress measurements may be a practical method of measuring the molecular weights of raw polymers directly in the solid state. R. D. Andrews, N. Hofman-Bang,[2] and A. V. Tobolsky, Princeton University, Princeton, N. J.

Use of the Electron Microscope in Exploring the Smoothness of Surfaces. The application of the electron microscope in the study of surface detail has been greatly extended in recent months by the improvement of techniques which allow extremely small irregularities to be photographed. It is now possible to discern sharp surface discontinuities of magnitude less than five Angstrom units. The methods have been used to explore the detail in the surfaces of polymers such as collodion, polyvinyl formal (Formvar), and Polythene, and in the surfaces of non-organic materials such as crystals, thin evaporated films, and glass. Robley C. Williams, University of Michigan, Ann Arbor.

A Theory of Commercial Yarn Testing. A method has been devised for the application of the theory of the three-element shear model of Eyring and coworkers to textiles which does not necessitate the location of the "basic spring line" and is thus readily applicable to both yarn and filer tests and to the commercial inclined-plane and pendulum-type testers. It is also applicable as a first approximation to those textiles which do not possess a "basic spring line" as such. The method employs the conventional spring constants or elastic moduli, but determination of the viscous constant involves the magnitude of the relaxation in constant rate of elongation experiments (or the magnitude of the creep in constant rate of loading experiments) from the upper envelope per interval of time. The relation has been employed to establish the correlation between the visco-elastic properties of "slashed" and "unslashed" viscose tire cord rayon yarns and also to show the identity of single filament stress-strain relations with those of yarns of normal twist of the same textile. The simplicity of technique which enables this method to be used as a routine laboratory test for the determination of the visco-elastic properties of textiles affords it a distinct advantage over previous methods which were often unsatisfactory from both a theoretical and an experimental viewpoint. Charles J. Geyer, Jr., American Viscose Corp., Front Royal, Va., and C. H. Reichardt and George Halsey, both of the Textile Foundation, Princeton.

Creep, Recovery, and Permanent Set for GR-S and *Hevea*. In all the tests with *Hevea* and GR-S a considerable part of the creep was due to permanent set. The proportion increases with the elongation and GR-S shows much more than *Hevea*, but a small portion of it is due to permanent set. At the start of the creep test the flow appears to be largely to the reversible yielding of relatively weak bonds which can reform under the action of the elastic network when the load is removed. For longer periods of time or for higher elongations the flow involves more deepseated changes in structure. Larger units of structure are displaced or stronger bonds broken with resultant permanent molecular displacement upon removal of the load. For *Hevea* at high elongations it is probable that flow occurs in the amorphous material between the crystallites, with whole crystallites being displaced with reference to each other. Under such circumstances the original relative molecular configurations cannot be reassumed upon removal of the load. Correction of the

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creep curves for permanent set gives nearly straight lines on a plot against logarithmic time. S. D. Gehman, Goodyear Tire & Rubber Co., Akron, O.

The Thermodynamics of a Strained Elastomer. I. General Analysis. The thermodynamic functions of principal interest in a strained elastomer are the entropy and energy of deformation. The volume is of secondary importance, and it can be assumed, with sufficient accuracy for most purposes that the volume is linear to the temperature and the mean pressure. The basic differential equations of thermodynamics can then be integrated, yielding expressions for the energy and entropy of deformation in terms of observable quantities. In the present analysis the volume effects due to changes in mean pressure and crystallinity are taken into account, and the effects associated with change in shape are sharply separated from those associated with change in volume. It is shown that the superelastic functions of deformation previously published have a very general validity. M. Mooney, United States Rubber Co., Passaic, N. J.

The Thermodynamics of a Strained Elastomer. III. The Thermal Coefficient of Modulus and the Statistical Theory of Elasticity. Published thermo-elasticity data are critically analyzed by means of thermodynamic equations developed in the first paper of this series. Equations known to be of the proper form are fitted by least squares to the experimental data, which were first corrected to allow for the changes in shape when tested under variable temperature and constant volume. If the measurements are accepted as truly reversible, the data show that several different elastomers depart considerably in some respect from the predictions of the statistical theory of elasticity. Some thermo-elasticity measurements in torsion are reported which seem to give the most reliable evidence that stress is proportional to absolute temperature. L. E. Copeland and M. Mooney, U. S. Rubber, Passaic.

The Effects of Pile Bombardment on Uncured Elastomers.[3] Previous work on the effects of ionizing radiations on hydrocarbons has established that four competitive processes are usually operative: (1) dehydrogenation; (2) condensation or polymerization; (3) hydrogenation (action of nascent hydrogen on any unsaturated matter present); and (4) decomposition (C-C cleavage). The chain reacting nuclear pile offers an ideal means for subjecting relatively thick samples of matter, such as rubber, to uniformly high concentrations of radiation. Such studies on natural rubber, Butyl rubber, and polyisobutylene allow one to draw the following conclusions: (1) uncured natural rubber undergoes a slight curing action when exposed to pile radiations; (2) polyisobutylene samples are appreciably degraded by pile radiations; (3) the same effects, as noted in (1) and (2) are greatly enhanced by secondary alpha particles produced by an (η, α) reaction on $boron^{10}$ (milled into the elastomer); however even a two-hour bombardment of natural rubber yields a product greatly inferior to sulfur vulcanizates; (4) pile bombardment does not introduce measurable unsaturation in polyisobutylene and decreases the unsaturation in natural rubber only slightly; (5) a typical Butyl rubber stock is permanently degraded by pile irradiation, showing upon cure reduced tensile strength when compared to that of a control sample; and (6) natural rubber shows a weak, but measurable radioactivity days after bombardment, probably due to its mineral content, but polysiobutylene is not appreciably active. W. L. Davidson, Clinton National Laboratory, Oak Ridge, Tenn., and I. G. Geib, B. F. Goodrich Co., Akron.

Dynamic Mechanical Properties of Rubber-Like Materials.[4] The differential dynamic Young's modulus for representative rubber-like materials has been measured over a frequency-temperature range which at its widest limits extends from 10^{-1} to 10^{5} cycles per second and from -50 to 100° C. This dynamic modulus, for the case of small sinusoidal strain variations, is a complex number so that for each experiment both a real modulus and a loss angle tangent are reported. Described are five methods of measurement which have been used to obtain natural frequency, resonant frequency, bandwidth, decrement, etc. Methods include mechanical and magnetostrictive excitation. In addition the bulk wave modulus and its loss-angle tangent at 10^{7} cps. are measured by an ultrasonic-pulse method. The results show the existence of dispersion over at least six decades of frequency. The loss factor and complex compliance are analyzed and discussed as functions of frequency and temperature. The dynamic modulus results, in the limiting case of very low frequency below the range of appreciable relaxation efforts, are shown to be in agreement with the kinetic theory of rubber-like elasticity. Compounds of Butyl, GR-S, neoprene, nitrile type and natural rubber are considered and characteristic differences are described. A. W. Nolle, Massachusetts Institute of Technology, Cambridge, Mass.

Method for the Absolute Measurement of Dynamic Properties of Linear Structures at Sonic Frequencies. A full account, including the theoretical basis, is given of a method whereby the dynamic stretch modulus, coefficient of internal friction, and hysteretic energy loss of textile yarns and cords, composed of either continuous filaments or staple fibers, can be accurately determined at longitudinal-vibration frequencies above 100 cycles/sec. The method, which employs electromagnetic excitation, is applicable also to glass cords and metallic wires and cables. Results have been obtained at frequencies extending to above 300 cycles/sec. A concise description is given of the improved stretch vibrometer. Results on a typical cotton cord show that energy absorption by this instrument is negligible, permitting the calculation of an accurate internal-friction coefficient and absolute hysteretic loss. Measurements on eight natural and synthetic textile fibers reveal that the dynamic moduli range from 6.4×10^{10} dynes/sq.cm. for Velon monofil to 54×10^{10} dynes/sq.cm. for a ramie cord. The dynamic moduli of Fiberglas and steel cords were found to be 54 and 106×10^{10} dynes/sq.cm. respectively. The internal-friction coefficients are found to vary hyperbolically with frequency; in a 11/4/2 cotton cord, for example, it varies from 1.5 to 8.0×10^{6} poises between frequencies of 60 and 320 cycles/sec. W. James Lyons and Irven B. Prettyman, Firestone Tire & Rubber Co., Akron.

Transducer Measurements of the Mechanical Properties of Polymer Solutions. Apparatus has been designed to study the mechanical properties of concentrated polymer solutions in small oscillating deformations at audio frequencies. A rod driven by a coil in a magnetic field oscillates vertically along its axis in a cylindrical tube of solution. The gap between rod and tube is one mm., and the amplitude of vibration about 0.002-mm., so the maximum shear is very small, and the maximum rate of shear moderately small even at 1,000 cycles. By measuring the electrical resistance and reactance of the coil when in motion and when rigidly clamped, or when in motion with different masses attached to vary the inertia, one can obtain the mechanical resistance and reactance of the system from well-known transducer relations. The former yields the real part of the dynamic viscosity of the solution, η'; the latter, under favorable conditions yields the real part of the dynamic rigidity, G'. For polymer solutions the viscosity η' is found always to be very much smaller than the ordinary viscosity measured in steady flow. Examples of experimental data will be given. Thor L. Smith, John D. Ferry, and Frederic W. Schremp, University of Wisconsin, Madison, Wis.

In addition to the foregoing the following papers will also be presented before the Division: "The Viscosity of Glass," Howard A. Robinson and Edward M. Man, Jr., Armstrong Cork Co., Lancaster, Pa.; "The Hydrolysis of Proteins," H. B. Bull, Northwestern University, Evanston, Ill.; "The Study of Macromolecular Reactions of Biological Interest," Paul Doty; "Proteins as Polycondensations of Amino Acids," Dorothy Wrinch, Smith College, Northhampton, Mass.; "Viscosity and Streaming Birefringence of Nucleic Acid," Jesse P. Greenstein, National Cancer Institute, Bethesda, Md.; and "Studies of the Melting Points, Rigidities, and Optical Activities of Gelatin Gels," John D. Ferry and John E. Eldridge, University of Wisconsin.

[3] Part of the experimental work for this report was performed under Contract No. W-35-058, Eng. 71, for the Atomic Energy Commission while Dr. Davidson was a member of the Clinton Laboratories Training School on leave from Goodrich.

[4] This work was supported in part under Contract NObs-25391, Task No. 1, with the Bureau of Ships, Navy Department.

New Hycar Rubbers

TWO new Hycar oil-resistant synthetic rubbers have been introduced by B. F. Goodrich Chemical Co., Rose Bldg., Cleveland 15, O., and are in commercial production. Designated as Hycar OR-25 EP (easy processing) and Hycar OR-25 NS (non-staining), these new rubbers have superior processing characteristics over the regular Hycar OR-25. The NS rubber differs from the EP type only in that a different antioxidant has been added to make it non-staining and non-discoloring. This advantage is outstanding in the fabrication of light-colored products where freedom from staining and discoloration are primary factors.

Principal cited advantages of the new rubbers over regular Hycar OR-25 are as follows: (1) both band on the processing mill rolls very quickly and decrease milling time; (2) they have better extrusion characteristics because of less nerve and heat build-up; (3) they have excellent high-temperature mixing properties; (4) they have better fusion and mold flow properties; and (5) they provide increased building tack for laminated products such as frictioned stocks and calendered sheeting. Preliminary investigation indicates that to obtain a state of cure with the new rubbers equivalent to that with regular Hycar OR-25, the quantity of sulfur used should be increased by 0.25-part per 100 parts of rubber polymer.

The Pacific Chemical Exposition and Industrial Conferences

THE first Pacific Chemical Exposition and Industrial Conferences, sponsored by the California Section of the American Chemical Society, was held in the Civic Auditorium, San Francisco, Calif., October 21-25, and was a marked success. Although the exhibitors were not so numerous as in similar shows held in New York and Chicago, no effort was spared to make the Exposition as interesting as possible to the visiting public, which numbered about 20,000.

Programs at the Industrial Conferences were arranged by various groups of the California Section, A. C. S., local groups of the American Institute of Chemical Engineers, the American Institute of Mining & Metallurgical Engineers, the Institute of Food Technologists, the Pacific Insecticide Institute, the Chemical Market Research Association, the Golden Gate Paint & Varnish Club, and the Northern California and the Los Angeles Rubber groups.

The Program of the Rubber Groups

The program of the two California Rubber groups which was under the personal direction of L. H. Dimpfl, of California Research Corp., consisted of two afternoon sessions, one on October 23 and the other on October 24, and an evening program on October 23. In Mr. Dimpfl's opening remarks at the beginning of the sessions on rubber he stated that the theme of this series of presentations was specially designed to assist development and design engineers to a better understanding of the physical properties of natural and synthetic rubbers and the kind of performance that could be expected from these rubbers in service. Such information should help technologists to use the various polymers more effectively as an engineering material, whether in present equipment or in those resulting from future developments, he said.

The first paper of the afternoon session on October 23 was on natural rubber and was given by Leonard Boller, of Technical Coatings, Inc., Pasadena, Calif. Mr. Boller was formerly president of the Northern California Rubber Group and has had wide experience in the rubber industry at the Goodyear Tire & Rubber Co. and the Sierra Rubber Co. in Los Angeles and the Pioneer Rubber Mills, Pittsburg, Calif. He first described the sources and methods of preparation of natural rubber and then discussed the process of vulcanizing both soft and hard rubber. He pointed out that the development of modern organic accelerators and the wide use of antioxidants with the resultant improvement in physical properties and age resistance had, in the last few decades, greatly broadened the field of usefulness of products made from natural rubber. These developments, along with the wide use of carbon blacks in rubber compounding, have contributed much to the use of natural rubber as an engineering material. The rubber compounder is still faced with many problems and the intelligent use of the materials available along with a good estimate of the service conditions to which the product may be exposed is essential for the production of the best compound to do the job, Mr. Boller said. Stress was also laid on the importance of the proper processing of any compound through the plant.

Following Mr. Boller's talk, the sound film, "The Making of a Tire," was shown through the courtesy of Firestone Tire & Rubber Co.

The next paper, on GR-S rubbers, was given by D. C. Maddy, of Harwick Standard Chemical Co. He first considered the different materials used in GR-S polymerization and then explained the methods of controlling the polymerization process in order to demonstrate the many variations possible in the production of polymers of varying properties. Mr. Maddy mentioned that many of the properties of the experimental polymers that have been and still are being made are superior to those of Standard GR-S, as we know it.

From the economic standpoint it was brought out that the average annual world production of natural rubber for the years 1934-1940 was about 1,025,000 long tons, and that for the first three months of 1947 the total consumption of all rubbers in the United States was at an annual rate of about 1,190,900 long tons. Since the United States has only 6% of the world's population, almost anything could happen to the price of natural rubber if the other 94% of the world started to bid for the product. The speaker also pointed out that since 1,000 American workmen in a synthetic rubber plant are equivalent to the rubber producing ability of 20,000 natives on a natural rubber plantation, a rise in the standard of living and the wages paid the plantation workers might conceivably put the price of natural rubber at a competitive disadvantage with synthetic rubber.

Synthetic rubbers were compared with natural rubber by emphasis on the superiority of synthetics over natural rubber in their resistance to deterioration by oils and organic solvents and in their resistance to oxidation and aging by heat, ozone and strong oxidizing agents. The greater degree of impermeability of synthetic rubbers to gases was likewise mentioned. The superiority of natural rubber over synthetics in processing properties, elasticity and extensibility, resiliency (low hysteresis), and in resistance to stiffening at low temperatures was indicated.

GR-S performs creditably in several classes of service, it was said. Camelback or recapping material made from GR-S is about equal to that made from natural rubber. In many mechanical goods applications GR-S has been found to be equal to or even better than natural rubber. Many applications in belting have been in use for some time with no appreciable difference noted in the life of the product, whether made from GR-S or natural rubber. In colored goods the non-staining GR-S polymers have the advantage over natural rubber.

The necessity of using fillers of the reinforcing type to obtain maximum physical properties of the GR-S vulcanizate was mentioned.

In conclusion Mr. Maddy called attention to the fact that with the present GR-S and with the future development of new polymers, the rubber compounder now has additional materials with which to work which will make his job easier if he keeps up with new developments as they are reported.

The third talk on neoprene synthetic rubber, was made by Herman Jordan, of E. I. du Pont de Nemours & Co., Inc. After a brief review of the history of the development of neoprene, methods of compounding, processing, and vulcanizing, as used with this rubber, were discussed. Special attention was then directed toward the ways in which neoprene differed from natural rubber in physical and chemical properties.

Neoprene has remarkable resistance to oxidation and also is superior to natural rubber in resistance to sun-cracking. This property accounts for the use of neoprene in garden hose, cable covers, and lately in white sidewall tires. Neoprene, furthermore, is more resistant to flex-cracking and gives longer service than natural rubber in tires; mileages of 50,000 frequently are obtained with neoprene treads. Experience has also shown that neoprene in soles and heels and tires has greater resistance to skidding, even on wet smooth surfaces.

Neoprene compounds are more heat resistant than natural rubber compounds, particularly in the range between 180 and 300° F., it was said. Resistance to oils and solvents was next discussed, and it was explained that while neoprene compounds swell, they do not lose their physical properties to the extent that natural rubber compounds do. Water also swells neoprene compounds to a degree, and for low water absorption, special compounds should be used.

Other properties of neoprene that differ somewhat from those of natural rubber are the necessity of using different accelerators to speed up the cure of neoprene since sulfur is not a vulcanizing agent for this rubber. Neoprene conducts heat more readily than natural rubber, but is less permeable to gases.

Some of the different types of neoprene and neoprene latices were mentioned including freeze-resistant neoprene and a new tough polymer especially suited for crepe soles. While this latter type has the advantage of superior oil and age resistance as compared with natural rubber, it does not have the tendency of natural rubber crepe to flatten out and therefore wears better, it was added. This type is also blended with other neoprenes to give them greater uncured stiffness for processing such products as soft extrusions. Among the latest developments is a neoprene latex which can be used to impregnate the toughest paper, greatly increasing the strength and flexibility of such papers.

Mr. Jorden concluded his talk by mentioning some of the more important uses of neoprene such as: oil and gasoline hose, conveyer and transmission belts, oil field products, garden hose, elastic thread, foam sponge, adhesives, tank linings, flooring, many special molded items, protective clothing, gloves, etc.

The next talk, on Hycar American Rubbers, was given by R. E. Bitter, of B. F. Goodrich Chemical Co. This speaker first reviewed the development of these nitrile-type and styrene-type rubbers. He remarked that the most important types of Hycar rubbers from an industrial standpoint are the oil-resistant rubbers, Hycar OR-15 and OR-25. With regard to the soluble type, OS-10 this rubber is being supplanted largely by natural rubber and certain of the GRS polymers, owing to cost, although in several applications, such as binders for abrasive cut-off wheels, heat resistant hard rubbers, and certain electrical applications, it is still being used regardless of cost because of superior properties not obtainable from any other current polymer.

The chief property of interest to rubber compounders and design engineers is the oil resistance of the nitrile-type Hycar rubbers, Mr. Bitter explained. Compounds prepared from these rubbers that swell 50% or less in the medium selected were classed as having good resistance; those that swell between 50 and 100% were classed as suitable only for certain applications and under certain restricted conditions, and Hycar OR rubbers in which

the volume change is greater than 100% are not usually recommended for service in liquids. Abrasion resistance of these oil resistant compounds is 35 to 50% better than equivalent natural rubber compounds at elevated temperatures, and in the presence of oil this superiority is even more pronounced. Other advantages of Hycar compounds, such as good resistance to the effect of temperatures up to 250° F., low compression set, resistance to oxidation or aging, were also discussed.

Excellent hard rubbers, known as Ebonars, can be produced from Hycar OR rubbers, and these are superior to ebonites of natural rubber and hard compositions of other synthetics in their ability to withstand higher temperatures without softening or distortion and in their high impact resistance.

The use of Hycar OR rubbers in cement and adhesive compounds was next explained, and then data on the properties of these rubbers in comparison with natural rubber, GR-S, and neopene in a general mechanical goods-type stock were presented.

New fields of development in the blending of Hycar OR rubbers with vinyl and also with phenolic resins were then discussed. It was mentioned that Hycar Polyblends, an intimate mixture of Geon 101 (polyvinyl chloride resin) and a special Hycar OR rubber, were available in crepe sheet form and could be processed on regular rubber equipment.

Two new Hycar rubbers, Hycar OR-25 EP, stabilized with Stalite, and Hycar OR-25 NS, stablized with non-discoloring antioxidants and widely used for blending with vinyl resins, were announced.

In addition to known applications of Hycar rubbers, new developments including pile fabrics backed and protected with Hycar latex which can be dry cleaned, waterproof papers saturated with this latex, sausage casings unaffected by fats, adhesives for brake linings which eliminate riveting, and last, but not least, an improved bubble gum were mentioned.

"Thiokols" were the subject of the talk by W. E. Boswell, of Thiokol Corp. The compounding, processing, and properties of the crudes, A, FA, ST, and PR-1, were discussed, and differences in compounding, processing, formulae, and physical properties explained with emphasis on the outstanding characteristics such as solvent resistance, aging, recovery, easy molding, etc., of these materials. Many practical uses of all the above crude types were given, and it was stressed that the "Thiokols" are definitely specialty materials and are not trying to compete with other oil-resistant rubbers, but fit into special applications where others fail.

Information on water dispersions of "Thiokols" followed with data on particle size, specific gravity, various methods for agglomerating and film forming was provided. Specific mention of MX, MF, WD-2, and WD-6 was made, with uses and good features of each and solvent resistance and aging characteristics underlined. Likewise mentioned was the use of these dispersions in reverse-phase coatings and the fact that they could be tailor-made for specialty applications.

The "Thiokol" liquid polymers, LP-2 and LP-3, were then described, and data on specific gravity, viscosity, molecular weight, stability, moisture control, pH, etc., given together with the general theory of the process of catalyzing or curing, types of oxidizers or curing agents, typical compounds and methods of compounding, and the physical properties of such compounds. Many present and future possible uses of these liquid polymers were noted, with accent on their solvent resistance and good aging characteristics.

Mr. Boswell concluded his talk with a general summary of all "Thiokol" materials and their definite place in the field of synthetic rubber-like materials.

Perbunan nitrile-type rubbers were described by R. M. Howlett, of Enjay Co., Inc., who explained that there are four grades: Perbunan 18, Perbunan 26 NS, Perbunan 26 NS60, and Perbunan 35 NS 90. The first number of the grade indicates the approximate acrylonitrile content; NS, when it appears, signifies that the polymer contains an excellent non-staining, non-discoloring type of stabilizer, and the last number gives the approximate Mooney viscosity of the polymer, it was explained. Perbunan 26 NS is a regular grade, and Perbunan 26 NS60 is a relatively new polymer that has greatly improved processing characteristics. A very definite reduction in the time required for either mill or Banbury mixing, easier molding, and much smoother extrusions was attributed to the 26 NS60 grade. The two 26 grades are being used extensively in oil and gasoline hose.

Perbunan 18 is employed where very low temperatures are encountered and oil resistance is required. Perbunan 35 NS90 is used where maximum resistance to swelling by oil and gasoline is required.

Properly compounded Perbunan compounds have good resistance to high temperatures, low compression set, high resistance to abrasion and flexing as well as good resistance to fats and oils. Experience has indicated that Perbunan compounds do not continue to get stiffer on prolonged exposure to low temperatures. Some of the products in which Perbunan is used because of the need of one or more of these properties were mentioned including oil well wipers and packers, revolving shaft seals, gaskets, milking machine inflations, printer rolls and blankets, and textile machinery parts.

The Perbunans are compatible with vinyl resins in the same manner as other nitrile rubbers and in many instances give improved service life or permit the vinyl resins to enter into fields from which they were barred when used with ester-type plasticizers, it was said. The Perbunans are also employed as "alloying" agents with certain modified phenolics, and in this application they raise the impact strength of the phenolics and serve to expand the field of the use of these resins, it was added.

The talk on Butyl rubber by I. E. Lightbown, of Enjay, included a demonstration of the production of this rubber from the liquid monomers. The low temperature and the rapid rate of polymerization of Butyl rubber were compared with the relatively higher and slower polymerization rate for GR-S rubber.

The speaker emphasized the particular advantages of Butyl with special reference to its use in inner tubes. Many of the details of tests that have been conducted for several years to prove that Butyl rubber is a better material for inner tubes than natural rubber were reviewed. Because of the remarkable ability of Butyl rubber to hold air, automobile drivers now have to inflate their tires only three or four times a year; the car, since it rides on tires which are always at the proper inflation, is easier to handle and steer; the spare tire is always at the proper pressure, and, most important of all, tires wear longer. Extensive tests have shown that tires containing Butyl inner tubes give 10 to 18% better tread wear than tires containing natural rubber tubes, it was stated by the speaker.

Evening Session and Panel Discussion

The evening session on October 23 featured a talk on "Molecular Structure and Mechanical Properties of Polymers" by Herman F. Mark, of Polytechnic Institute of Brooklyn, and a discussion on compounding in which questions were answered by a panel of experts consisting of: Mr. Boller; George Petelin, Goodyear; E. B. Reinbold, Pacific Rubber Co.; W. D. Good, American Rubber Mfg. Co.; R. D. Kettering, Oliver Tire & Rubber Co.; J. A. Liljegren, Pioneer Rubber Mills; and R. E. Harmon, Office of Rubber Reserve. Ross Morris, Mare Island Laboratory, of the Northern California Rubber Group, acted as chairman of this session.

Dr. Mark in his talk first explained that high polymers represent a group of substances with widely varying mechanical properties, and, as such, they furnish useful materials as synthetic rubbers, fibers, and plastics. One of the principal requirements for getting strong, tough, and elastic materials is that the polymers used should have a high molecular weight. Materials with molecular weights below 10,000 are usually brittle and weak. Another important property is the capacity of the long-chain molecules to crystalize. This capacity provides for a fairly clear distinction between polymers as fiber-, rubber-, or plastic-formers, in the following manner: (1) If a material has a high softening point (above 250° C.), a great tendency to crystallize, and if the crystals can be easily oriented, it is a good *fiber*-former. (2) If a material has a low softening point (below —40° C.), a great tendency to crystallize, when stretched, but does not crystallize in the unstretched state, it is a good *rubber*-former. (3) If a material has an intermediate softening point (100-200° C.) and does not crystallize under any conditions, it is a good *plastics*-former, Dr. Mark explained.

Questions asked of the panel of experts during the discussion on compounding covered a wide range of subjects. It is interesting to note, however, that of the more than 20 questions asked approximately half of them had to do with the compounding of synthetic rubbers. Another item of major interest seemed to be means of compounding various rubbers to obtain maximum resistance to the action of acids, alkalies, and organic solvents. Other questions were concerned with the advantages and disadvantages of various softeners in rubber compounding and improvements in tire construction and wear.

The Second Afternoon Session

The second afternoon session on October 24 heard a program of five papers. Curtis R. Wolter, of United States Rubber Co. and chairman of the Los Angeles Rubber Group, presided.

"Carbon Black and Other Compounding Agents" was the title of the first paper, by W. R. Snyder, of R. T. Vanderbilt Co. Compounding agents for rubber include vulcanizing agents, accelerators, antioxidants, softeners, and fillers, of which fillers are the largest class and are divided into carbon black and non-black groups, it was noted. The non-black group includes various inorganic carbonates, silicates, sulphates, etc. The carbon blacks are classified as channel, furnace, and thermal-type blacks. Data was presented on the particle size, and the methods of manufacture of the vari-

ous blacks and their specific uses in rubber compounds were discussed.

"Hard Rubber, Foamed Rubber, and Rubber Specialties" was the subject of the paper given by R. T. Hickcox, of Goodyear. The chemistry and processes involved in the manufacture of these products were considered. The hard rubber reaction appears to involve principally the production of thioether linkages at the carbon-carbon double-bond to couple adjacent rubber molecules or to produce a thioozonide structure. Substitution reactions are also evidenced by the production of hydrogen sulfide during the vulcanization reaction, this speaker stated.

With regard to foamed rubber, a predetermined amount of air is whipped into compounded latex to arrive at the proper sponge density, it was explained. Sodium silicofluoride or a similar gelling agent is added at the end of the frothing period. This silicofluoride hydrolizes to lower the pH and cause coagulation of the latex compound. The "set" latex rubber structure is then sufficiently strong to support its own weight during subsequent curing operations.

In the production of chlorinated rubber there is good evidence that the chlorination reaction involves, first, substitution and then addition, at the double bond. The chlorine content of 65-68% of such rubber indicates considerable substitution, the speaker stated.

With hydrochlorinated rubber, hydrogen chloride adds on to the double-bond of the rubber molecule according to Markownikoff's rule with the chlorine atom adding to the carbon atom containing the methyl group. A final ripening period of hydrochlorinated rubber is necessary to convert the reaction product from an amorphous to to a useful crystalline structure.

In the presence of amphoteric halide acids, rubber cross-links at the double-bonds in the process of producing cyclized rubber. The most probable structure appears to be a six-membered ring containing one double-bond per ring. In the same manner as with the chlorination and hydrochlorination of rubber, the cyclization reaction is carried out in solution. The solvent is then removed by steam distillation after the reaction has been completed.

"The Mechanism of Reinforcement of Elastomers by Pigments" by Leonard H. Cohan, of Witco Chemical Co. and Continental Carbon Co., was the subject of another of the papers at this session. Dr. Cohan explained that reinforcement is generally associated with high tensile strength, modulus, and resistance to tear, and low resilience and plasticity in the unvulcanized state. Modulus class properties and tensile class properties were discussed in this paper, and in the case of the former the dependence of modulus on loading in accordance with certain theoretical equations was shown to be experimentally confirmed. The complete paper appears on page 343.

"The Development and Availability of Experimental and Special-Purpose GR-S Polymers" was dealt with by R. E. Harmon, of the Office of Rubber Reserve, RFC. The speaker began by describing the function of the Technical Service Section of the Office of Rubber Reserve as: (1) preparing technical bulletins and releases to be distributed to the rubber industry both directly and through publication in the rubber trade journals; (2) providing assistance in the development of special-purpose GR-S polymers having improved processing or physical properties. In connection with the latter, group or cooperative underwriting of developments was arranged for so that from 10 to 20 companies participated in some of these developments. Examples of experimental polymers produced in this manner are X-389, X-392, X-393, X-399, and X-405. The advantages of this method of procedure were explained as better availability for the consuming companies and more regular production schedules for ORR. To accomplish such developments best, however, it is still necessary to know more about the type of polymers which would interest specific consumers.

It was noted that to date more than 400 experimental (X-numbered) polymers had been scheduled for production in the various copolymer plants operated for ORR and that 23 of these have been promoted into the numbered classification, such as GR-S-10, GR-S-50, etc., not including GR-S latices. An experimental polymer becomes a numbered GR-S after it has been demonstrated that the X-numbered polymer has been produced and consumed in quantities of at least 200,000 pounds per month minimum over a period of from three to six months and where it appears to be experiencing a continuing demand, it was pointed out. GR-S numbered polymers are more readily available than X-numbered polymers unless production of the former is interrupted by material shortages or other unusual circumstances such as the necessary shifting of production from one plant to another.

This talk was concluded with a description of the numerous types of GR-S available and an explanation of the factors which influence end-product physical properties such as, monomers, reaction temperature, stabilization, emulsification, coagulation, and modification.

"Solubility of Hydrocarbon Resins and Their Behavior in Rubber Compounding" was the title of the paper given by P. O. Powers, of Battelle Memorial Institute. Dr. Powers reported that tensile strength, modulus, and elongations of natural and synthetic rubber compounds have been found to be related to the cloud point of coumarone-indene resins when these resins are used. The solubility of the resins can be readily measured by the determination of their cloud point, which was defined as the temperature at which a given resin becomes insoluble in a reference oil. This paper in its complete form will be published in a forthcoming issue of India Rubber World.

Cadwell on Tires of the Future

SIDNEY M. CADWELL, director of research and technical development for United States Rubber Co., spoke on "Tires of the Future" before a dinner-meeting of the Rhode Island Rubber Club on November 13 at the Crown Hotel, Providence, with more than 90 members and guests attending. Dr. Cadwell gave a general review of the development and growth of the pneumatic automobile tire and of the wartime development of GR-S tires, rayon and nylon tire cords, and Butyl inner tubes. The use of these synthetics will undoubtedly dominate tire development in the future according to the speaker. The use of synthetic rubber tires, rayon cords, and Butyl inner tubes will improve tire and tube performance and increase safety. In the discussion period following the talk, Dr. Cadwell declared that the safest tire today is made of GR-S with Butyl tube and rayon cord. He noted the growing interest in this country in the use of steel wire for tire cords and said that tremendous improvements in GR-S have been and are being made, particularly in low-temperature polymerization which yields polymers superior to standard GR-S in tire use.

At the business session following the technical meeting, elections for officers were held with the following results: chairman, Howard T. Fulton, Kleistone Rubber Co., Inc.; vice chairman, Franklin Springer, Davol Rubber Co.; and secretary-treasurer, Harry Schlosser, Burlow & Schlosser, Inc. Fred Newman, of Respro, Inc., and Roy G. Volkman, of U. S. Rubber, were elected to the board of directors for three-year terms; C. L. Kingsford, of Davol, and William Potterton, of Goodyear Footwear Co., were elected for two-year terms; and Fred Bartlett, of U. S. Rubber, and E. E. Zielstra, of Carr Mfg. Co., were elected for one-year terms. The group also unamimously approved a set of proposed by-laws which had been previously presented to the members.

Laboratory Directory

A COMPLETE listing of commercial and university testing and research laboratories throughout the country, together with indications of the type of commodities tested, has been compiled by the National Bureau of Standards. This pamphlet is now available at a price of 30¢ a copy from the Superintendent of Documents, Washington 25, D. C., as NBS Miscellaneous Publication M187, entitled "Directory of Commercial and College Laboratories." Information is given concerning 200 commercial laboratories, with 80 branches or offices, and 189 college laboratories used for research and testing as well as instruction. Listings are arranged both geographically and alphabetically to facilitate the ready finding of any laboratory.

Agricultural Engineers Meet

THE rubber industry will be represented at the winter meeting of the American Society of Agricultural Engineers, to be held December 15 to 17 at the Stevens Hotel, Chicago, Ill. In the rural electric program on the morning of December 15, Howard H. Weber, of United States Rubber Co., will speak on the use and limitations of aluminum conductors; Glenn Rowell, of Fire Underwriters Inspection Bureau, will discuss non-metallic sheathed cable in farm installations; and D. C. Sprague, of Pennsylvania State College, will talk on a course in farm wiring for agricultural leaders.

A panel discussion on "Flexible Power Transmission for Farm Machines—What Shall We Use?" will feature the power and machinery program on the morning of December 16. Speakers who will discuss four different types of transmission are: W. S. Worley, of Gates Rubber Co., on V-belts; R. W. Dormer, of L. H. Gilmer Co., on flat belts; E. M. Rhodes, of Baldwin-Duckworth Division of Chain Belt Co., on roller chain; and C. R. Weiss, Link-Belt Co., on detachable steel link chain.

Advance Dates for GR-S Permit Requests

UNDER date of October 30, the Office of Rubber Reserve notified the rubber manufacturing industry that recent fluctuations in the demand for GR-S, together with the cancellation from month to month of varying numbers of Purchase Permits previously issued by Rubber Reserve which had been taken into account in developing forward production schedules, have rendered impossible a proper and realistic scheduling by ORR of manufacturing operations at the various plants in the synthetic rubber program. The result, in view of the small number of plants presently operating in the program, has been an inability to achieve a proper relation of supply of GR-S to demand and the creation of factors preventing the most economic operation of the program.

In an effort to overcome these difficulties and to insure the availability of the required amounts of GR-S at the lowest possible cost, Rubber Reserve finds it necessary to institute a plan of forward placement of GR-S orders by purchasers on a firm basis. Such a forward purchasing plan will assure proper scheduling of production and fulfillment of contracts. If possible, Rubber Reserve will also undertake to produce and offer for spot sale such quantities of GR-S as are produced in excess of contract demands. The term "GR-S" as used herein shall include GR-S latices.

Beginning with the months of December, 1947, and January and February, 1948, all consumers who expect to purchase GR-S during these months and who desire firm delivery commitments will be required to submit their purchase requests for each of these months by the usual form of letter (one for each of the months involved) not later than November 12, 1947. Purchase requests for the month of March, 1948, and subsequent months shall be submitted not later than the twelfth day of the fourth month preceding the month in which delivery is desired. All such purchase requests shall bear the following statement which shall be inserted by the prospective purchaser on the face of the purchase request:

"This purchase request shall constitute an offer submitted to Rubber Reserve in accordance with the procedure prescribed in the Memorandum to All Rubber Manufacturers dated October 30, 1947, amending the General Sales and Distribution Circular, to purchase the quantity and type of GR-S specified herein."

(No such statement shall be inserted in purchase requests submitted in connection with spot purchases.) Upon approval of such purchase requests by Rubber Reserve, a Purchase Permit will be issued for the month or months covered by the request.

The issuance of a Purchase Permit will constitute a firm contract for the sale and delivery of the quantity and the type of rubber specified therein at the price published by Rubber Reserve and prevailing at the time of such issuance. If Rubber Reserve is unable to comply with a purchase request in respect to quantity of type of GR-S, it will notify the person submitting such request.

A consumer may at any time submit a purchase request covering a spot purchase of GR-S for immediate delivery or for delivery prior to the delivery date of established contracts. A Purchase Permit issued in answer to such a request shall not constitute a firm contract, but will be honored only to the extent that Rubber Reserve determines that the supplies of rubber on hand will permit. Such Purchase Permits will be in the form presently used.

Any increases in present published prices for GR-S shall become applicable insofar as concerns forward sales at the end of the third full month after issuance by ORR of notice of such price increase. For spot orders the price increase shall apply on and after date of issuance of notice of price increase. Any decrease in prices shall be applicable at the end of the month in which notice is issued for both forward and spot sales.

In the event that Rubber Order R-1 is hereafter amended to reduce the minimum quantities of GR-S required for use in any particular end-product, Rubber Reserve upon request of the consumer will agree to a comparable reduction in the quantity of rubber covered by then-existing contracts.

The aforegoing procedure on forward purchasing shall also apply to experimental GR-S rubbers produced under "X" number designations. Delivery may be obtained on a spot basis within reasonable limits as specified by Rubber Reserve for a period of time beginning with the initial production of such "X" rubbers until the end of the third full month thereafter (at which time firm orders would be effective).

Rubber Division Library

AS FIRST announced during the recent meeting in New York, the Division of Rubber Chemistry of the American Chemical Society is sponsoring the development of a comprehensive central library on rubber technology which will be a part of the Bierce Library at the University of Akron, Akron, O. The first step in this development will be the establishment of a specialized Union List of Serials to be available through the Bierce Library. This list will cover all journals of special interest to investigators in the fields of rubber, resins, and plastics. The journals will be available through the University of Akron on interlibrary loans. The initial Union List, to be available in January, 1948, has been made possible by the cooperation of the Firestone Tire & Rubber Co., The General Tire & Rubber Co., The B. F. Goodrich Co., Goodyear Tire & Rubber Co., United States Rubber Co., and the University of Akron.

It is hoped that other libraries having sections devoted to the rubber and plastics field will cooperate so that the list of available journals can be as complete as possible. Libraries interested in participating are invited to write either to the Librarian, University of Akron, Akron, O., or to B. S. Garvey, Jr., chairman of the Committee for a Library of the Division of Rubber Chemistry, who can be addressed % Sharples Chemicals, Inc., 123 S. Broad St., Philadelphia 9, Pa.

Where journals are missing, the Division will help fill in the gaps by using the facilities of the A. C. S. to find the missing journals and then either buy them or have them bought by a cooperating library. The preparation of the Union List is being financed by the Division, and the work is being done by members of its Library Committee.

The original recommendation for the library was made by a special committee appointed by W. A. Gibbons, of U. S. Rubber, and consisting of E. B. Babcock, Firestone, C. W. Christensen, Monsanto Chemical Co., H. E. Fritz, Goodrich, C. P. Hall, C. P. Hall Co., and R. P. Dinsmore, Goodyear. W. W. Vogt, of Goodyear, appointed Dr. Garvey chairman of the Library Committee to implement the recommendation. Other members of this committee are Miss Leora Straka, Goodyear; Mrs. Phyllis H. Crane, Firestone; H. N. Stevens, Goodrich; H. C. Tingey, U. S. Rubber; R. B. Appleby, E. I. du Pont de Nemours & Co., Inc.; Frank Kovacs, Seiberling Tire & Rubber Co.; and Miss Dorothy Hamlen, University of Akron. The work on the Union List has been done by a sub-committee consisting of Miss Straka, Mrs. Crane, and Miss Hamlen, with assistance from Miss Lois Brock, General, and Miss Fern Bloom, Goodrich.

Quebec Group Meetings

THE Quebec Rubber & Plastics Group held a meeting on November 13 at the Ritz Carlton Hotel, Montreal, P. Q., Canada. An assemblage of 70 members and guests heard Albert E. Cliffe speak on "The Wicks of Life." Dr. Cliffe's talk was on vitamins and was most interesting and informative. The speaker cited many instances where controlled diets with necessary vitamins had brought about amazing cures. He particularly stressed the important role which vitamins play in affecting dispositions. The Group's next meeting will be held in Montreal on December 11. J. C. Reid, of Canadian General Electric Co., Ltd., will be guest speaker.

The Group's first meeting of the current season was an informal gathering on October 16, attended by some 60 members. In opening the meeting Chairman A. S. McLean saluted the old members present and warmly welcomed new members. After briefly dealing with business matters Mr. McLean outlined the program for the coming season which consists of regular monthly meetings on the following dates: November 13, December 11, January 8, February 12, March 11, April 8, and May 13. All meetings will be held at the Ritz Carlton Hotel.

The 1947-48 executive officers of the Quebec Group are: chairman, A. S. McLean, British Rubber Co. of Canada, Ltd.; honorary chairman, E. A. Thorne, Diamond State Fibre Co. of Canada, Ltd.; and secretary-treasurer, Paul Morvan, also of British Rubber. Committee members follow: special events, W. R. Blundell and N. Burnett, both of Dominion Rubber Co., Ltd.; membership, A. W. Bell, of St. Lawrence Chemical Co., Ltd. and J. H. McCready, of Hale Bros., Ltd.; publicity, F. D. Cobbett, of Canadian General Electric; program, Andre Gagnon, of Acton Rubber, Ltd., and Frank Rice, of Canadian Industries, Ltd.; and reception, H. Loiselle, of Northern Electric Co., Ltd., and H. Hencher of H. L. Blachford, Ltd.

Rubber Dispersions Discussed

SOME 200 members and guests of the Los Angeles Rubber Group attended a dinner-meeting on November 4 at the Mayfair Hotel, Los Angeles, Calif. At the technical session preceding the dinner Sidney N. Pinhasik, production superinten-

(Continued on page 416)

RUBBER WORLD

NEWS of the MONTH

Highlights—

The year 1947 is now expected to chalk up for the rubber goods industry another record in production and sales even higher than that achieved in 1946. Unless higher priced natural rubber and a shortage of GR-S prove too much of a detriment, consumption of rubber in the United States in 1947 may reach 1,100,000 tons. Hearings on rubber legislation in Texas, Kentucky, Ohio, and Washington, D. C., conducted by the House Armed Services subcommittee on rubber, showed some evidence of differences of opinion with regard to mandatory use of synthetic rubber, disposal plants, and termination of the patent pool and exchange of information agreement. It seems quite probable that the government will retain a considerable degree of control of the production and use of synthetic rubber for at least another year and that the present or higher levels of consumption of synthetic rubber will continue in order to permit the accumulation of a larger strategic stockpile of natural rubber. The URWA decided to sign non-Communistic affidavits in order to qualify to use the NLRB, although the union condemned the Taft-Hartley Law as "unreasonably restrictive, destructive of sound labor-management relations, and punitive by design."

1947 Production Likely to Set New Record; Rubber Legislation Hearings On

The expectation of the rubber goods manufacturing industry of a turndown in production rate during the third or fourth quarter did not materialize, and the industry appears likely to establish new records in output at a level higher than that achieved in 1946. In the tire field consumer buying has held up well, and the greater new equipment demand resulting from the more satisfactory automobile manufacturing rate has the tire companies hard put to fill all orders. Mechanical goods and soles and heels producers are experiencing a situation in which, even operating at or near capacity, their backlog of orders continues to grow. Other branches of the industry are reported to be similiarly active.

All is not clear sailing, however. An unfortunate shortage of GR-S and higher prices and limited supplies of natural rubber make it difficult for rubber goods manufacturers to keep their plants operating at the new high level required by the continuing demand for their products. Slowly increasing production of GR-S will not provide much relief until the first quarter of 1948, and the price and availability of natural rubber does not encourage optimism.

Hearings on new long-term legislation on rubber began during November with the House Armed Services subcommittee headed by Rep. Paul Shafer of Michigan visiting plants in Texas, Kentucky, and Ohio and holding public hearings in these areas. The hearings in Akron, O., on November 14 and 15 dealt mostly with the position of the reclaimed rubber industry in the future rubber program, and final hearings began in Washington, D. C., on December 1, at which time the fabricating industry planned to present its recommendations.

Industry Production and Outlook

In the course of the last four or six weeks the production rate of the rubber goods industry, instead of leveling off at a point midway between the record high of the first quarter and the low of the midyear, took a decided upward movement, and output for the fourth quarter may exceed that of the first quarter. As a result, the industry may chalk up its highest year on record, exceeding even the notable record of 1946. Limiting factors are the difficulty in obtaining enough of the major raw materials, natural, synthetic, and reclaimed rubber, and the effect of present and contemplated price rises for rubber products on the demand for these products.

Tire production, for example, which in 1946 totaled about 82 million units (66.5 million passenger-car tires and 15.8 million truck and bus) and which in August, 1947, was expected to about equal that of last year, is now considered likely to total 87 or more million in 1947 (74 million passenger-car tires and 17 million truck and bus tires are the top estimate). According to the regular monthly report of The Rubber Manufacturers Association, Inc., November 19, 57,420,758 passenger-car tires and 13,472,991 truck and bus tires were manufactured in the first nine months of 1947. During the first nine months of 1946 the production of passenger-car tires was 47,320,982 and of truck and bus tires, 11,391,012.

The industry as a whole is continuing at a near capacity production rate without experiencing the cutbacks previously considered inevitable in the fourth quarter. In the tire field, reduced demand at the consumer level at the end of the first half of the year brought on what now appear to have been an ill-advised series of price cuts. These price cuts instead of stimulating demand, seemed to have reduced it still further, and distributers allowed their inventories to dwindle. Subsequently tire distributers began building up their stocks; consumer demand turned upward, and manufacturers have had to step up their output.

Unfortunately, with the rising price of natural rubber and the shortage of GR-S, accompanied by higher labor and other material costs, tire manufacturers found it difficult to raise and maintain a higher output. Also, lower profit margins finally caused The General Tire & Rubber Co. and the Norwalk Tire & Rubber Co. on November 10 to raise the price of their passenger-car and truck tires 7½%. The price of tractor tires was increased 5% by General. The Firestone Tire & Rubber Co. announced on November 24 a 6½% increase for passenger-car tires, a 5½% increase for truck tires, and a 7½% increase for tractor tires. The United States Rubber Co., on November 26, boosted the price of its passenger-car tires from 6% to 8%, truck tires from 5% to 7%, and tractor tires from 5% to 7.5%. Dayton Rubber Co., also on November 26, raised prices on passenger-car tires 6% to 7.5% and on truck tires 5% to 7%. Three companies announced increases in tire prices on November 28. The B. F. Goodrich Co. raised passenger-car tire prices about 5%, tractor tires 7½%, and truck tires 5½%. The Goodyear Tire & Rubber Co. upped its tire prices from 5% to 7½%, and the Lee Rubber & Tire Corp. also increased its passenger-tire prices between 6% and 7½% and its truck tire prices about 5%. Most of the other tire companies are expected to announce similar increases in the near future.

All of the above companies gave rising costs of labor and materials as the reason for the higher prices. General Tire mentioned rising trends in general administration costs, rubber and other raw materials as well as transportation rates, in a letter to its distributers explaining the necessity of the higher tire prices. As an example of administrative costs which did not exist before the war General Tire cited reports required to 48 different federal agencies of the government in the course of operating its business. It was pointed out that since June, 1947, the cost of natural rubber has climbed from 13¢ to 23¢ a pound; petroleum products used in tire manufacture are 30% higher; stearic acid has gone from 17 to 29¢ a pound; and the recent decision by the Interstate Commerce Commission granting the railroads a rate adjustment adds up to an increase of approximately 10% for freight costs in the rubber industry.

Meanwhile the suit of the Department of Justice against the RMA and eight tire manufacturers charging conspiracy to fix tire prices was delayed further when defense attorneys were given until December 1 to file special motions. Not guilty pleas were entered in September.

The mechanical goods branch of the rubber industry is operating at new peak production levels. Conveyer belting is in great demand both at home and abroad, and all signs point to enough orders to keep the belt makers busy for two or three years at their present rate of activity. Millions of dollars woarth of conveyor belting are a part of the foreign aid program now being considered by Congress. This belting is for the reconstruction and modernization of the major coal producing countries abroad. It is also considered likely that a considerable volume of transmission belting will be required in this program. Then there is the field of automotive rubber goods where the higher automobile output now being achieved in this country has had the effect of requiring maximum production of companies manufacturing such goods. Sponge rubber goods, particularly those made directly from latex, would operate at much higher rates if the cost, quality, and availability of natural rubber latex were more satisfactory from the manufacturers' viewpoint. Further improvement in the latex sponge rubber process itself is also a factor in achieving a really high mass production rate. Not to be ig-

nored is the significant output of products made from plastic materials by the mechanical goods industry.

The sole and heel branch is experiencing a continuation of the heavy demand from shoe manufacturers for these products as a result of the scarcity and high price of leather. Companies whose greatest customers are shoe manufacturers expect to maintain their present production schedules during the first quarter of 1948, at least. Demand for crepe soles is still heavy, and large consumption is predicted for the coming year. Owing to a recent price release, sales of soles and heels to jobbers have taken a decided jump and are likely to continue at a higher rate for a month or more because of the jobbers' low inventory position.

Companies manufacturing rubber footwear are operating at a high but steady rate and should be able to avoid any lowering of that rate unless the proposed new tariff rate of imports of rubber footwear, equal to about one-half the previous rate, has the effect of causing U. S. manufacturers to share more of the home market with their competitors abroad.

The fabric market is still a factor in the coating field, and greater availability of these materials would permit greater output of proofed goods for which the demand is high. A further complication is the shortage of GR-S and the higher natural rubber price. Many companies in the coating industry would prefer to use more GR-S for reasons of processing and cost, but are able to obtain only a fraction of their needs.

Some details of the section of the report made to President Truman on foreign aid, with special reference to rubber products as prepared by a subcommittee on consumer goods under the chairmanship of John L. Collyer, president of the Goodrich company, were reported. It was emphasized that if our rubber goods plants operated only 250 days a year, the amount of tires, tubes and other transportation items available for export would exceed the current rate of export by more than 100%. The percentage of total production currently being exported were given as: passenger-car tires, 2.4; truck and bus tires, 10.7; tractor and implement tires, 3.2; camelback, 4.7; hose, 10.3; airplane tires, 9; and all tubes except bicycle, 23.2. By the end of the year the only one of the 30,000 products manufactured by the industry that will be in short supply is conveyer belting, the report said.

In actual dollar value, exports of rubber goods for the first nine months of 1947 totaled $167,282,271, a record high, according to a report of the Department of Commerce. If exports during the final quarter of the year average as much as $11,000,000 a month, the yearly total will reach $200,000,000, far above the $28,841,000 yearly average of the prewar period, 1935-1939. In the recent high years, 1944 ($185,111,052) and 1946 ($181,392,126), synthetic rubbers contributed heavily to exports, accounting for 45.5 and 18.2% of the totals. For the nine-month period of 1947 such exports have accounted for only 3.4% of the total, it was said. The value of exports of rubber products for September amounted to $14,250,239, a drop from the previous month. A continued decline in total value of rubber goods exports is expected during the final quarter of 1947, the Department of Commerce predicted.

An indication of the present outlook and trend in the rubber goods industry with regard to future activity may be gained from a letter to the shareholders of the Goodyear company, in which P. W. Litchfield, chairman of the board, explained the desire of the company to borrow $100,000,000 to finance a program of expanded production. It was stated that the company's debt had been reduced since before the war from $60,000,000 to the present level of about $36,000,000. During and since the war the company's sales volume has risen from a prewar average of $200,000,000 annually to the present volume of about $600,000,000 annually. To keep pace with this volume Goodyear directors have authorized additions and improvements in plant and machinery having a cost value of more than $100,000,000. Part of the 100-million-dollar loan will be used to defray the cost of the new equipment, and the remainder will be used to cancel the remaining 36-million-dollar debt.

The report of the Office of Materials Distribution on rubber production, consumption, and stocks showed an increase in the consumption of natural and synthetic rubbers from 86,290 long tons in August to 92,299 long tons in September. Consumption by type during September, according to preliminary reports was: natural, 50,522 tons (including 1,646 tons, dry weight of latex); GR-S, 33,344 tons; neoprene, 2,873; Butyl, 5,199; and nitrile types, 361.

New supply and production for September was: natural, 46,447 tons (including 464 tons, dry weight of latex); GR-S, 24,111; neoprene, 2,150; Butyl, 3,465; and nitrile types, 792 tons.;

Stocks on hand at the end of September were: natural, 121,833 tons (including 3,987 tons, dry weight of latex); GR-S, 54,074; neoprene, 6,104; Butyl, 15,356; and nitrile types, 3,594 tons.

Rubber Policy Activities

The tour of synthetic rubber plants by the House Armed Services subcommittee on rubber, headed by Representative Shafer and including Rep. Fred L. Crawford of Michigan and also representatives of the Office of Rubber Reserve, the Army-Navy Munitions Board, and the Office of Materials Distribution, Department of Commerce, began during the week of November 3. Originally scheduled for the week of November 10, the inspection tour and hearings were advanced one week because of the special session of Congress scheduled for November 17. The tour and the hearings were arranged to give the congressmen, charged with the responsibility of drafting new legislation on rubber policy, an opportunity to examine the synthetic and rubber goods manufacturing industry at first hand and to hear industry and public viewpoints on the subject.

The group arrived in Houston, Tex., November 5, and in the course of the next several days inspected the butadiene and Butyl rubber plants at Baytown operated by the Humble Oil & Refining Co.; the butadiene plant of the Neches Butane Products Co., Port Neches; the standby butadiene plant of Sinclair Rubber Inc., Houston; the copolymer plant of Goodyear Synthetic Rubber Corp., Houston; and the styrene plants of Dow Chemical and Monsanto Chemical companies at Texas City and Velasco. The latter plant is partially rebuilt. At public hearings in Houston, Representative Shafer declared that the United States must maintain its synthetic rubber industry. Not all of the synthetic plants will be kept in operation, but as part of the long-range rubber policy to be determined, some units will be kept in "standby" condition, ready for use in case of an emergency, he said. Hearings were also held in Beaumont and Freeport, Tex.

In Louisville, Ky., on November 10 the group visited the butadiene plant of the Carbide & Carbon Chemicals Corp., the copolymer plant of the National Synthetic Corp., and the neoprene plant operated by E. I. du Pont de Nemours & Co., Inc. Representative Crawford, at Louisville stated that if we let our synthetic industry die, it will be just what the producers of natural rubber want, and that the price of natural rubber would then be increased to 40¢ or even a dollar a pound. Therefore the government must step in and protect the synthetic rubber industry both for this reason and also to avoid a repetition of the difficulties experienced after the Japanese seized control of the Far Eastern natural rubber producing areas in 1942.

There was considerable discussion of the "mandatory use" as part of the future law on rubber policy, in connection with which Representative Shafer commented:

"If we require the consumption of a certain percentage of synthetic rubber, we will in effect be granting a monopoly to those who operate the synthetic plants. On the other hand, if we do not assure a market, no one will assume the risk of operating the plants."

Arriving in Akron, on November 12, the congressional delegation first visited the research center of the Goodrich company, under construction at Brecksville. The committee next went to the plants and laboratories of General Tire and of Goodyear Tire. Industry leaders met with the group at the Portage Country Club on the evening of November 12, at which time Representative Shafer warned rubber company executives to get their recommendations before his subcommittee before it begins drafting long-term legislation on rubber.

"When the job is done, and if you don't like it, it won't be because we haven't tried. It will be because you have failed to give us the information we need," he warned.

W. James Sears, RMA vice president speaking on behalf of the industry, assured Mr. Shafer that the industry would have its recommendations ready in time for the hearings of the subcommittee in Washington on December 1.

On November 13 an inspection was made of the research laboratory and plants of the Firestone company and of plants of the Goodrich and Mohawk Rubber companies. On November 14, plants of the Seiberling Rubber Co. and the Midwest Rubber Reclaiming Co. in Barberton were visited, and a public hearing was held in the Barberton high school. A second hearing was held in the Akron City Council chambers on November 15.

According to a report from our correspondent in Akron, the visit of the Shafer committee produced little that was either exciting or constructive in the opinion of observers in that city. Actually, Representative Shafer, subcommittee chairman, and Representative Crawford, were the only Congressmen present. They were accompanied by Irving W. Thomas, legislative assistant to Senator Cain; J. R. Blandford, counsel for the subcommittee; Walter N. Munster, of the Office of Rubber Reserve; and John Caswell, Rubber Division, Office of Materials Distribution, Department of Commerce.

Final hearings on the future rubber program were opened in Washington on December 1. While in Akron, Representative Shafer indicated that the committee has its ideas fairly well crystallized and gave the impression that a rubber bill will be introduced in the House some time in December or early January. Important

points which the new bill is expected to cover include the future operation of the GR-S plants, size of the natural rubber stockpile, methods of insuring continued use of GR-S, and disposal or "canning" of plants not currently needed.

The first of the two public hearings was devoted to the place of reclaimed rubber in the national rubber economy and how the reclaimed rubber industry may be affected by continued production and use of GR-S. Prominent figures in the reclaimed rubber industry who presented views were William Welch, president of Midwest Rubber Reclaiming and head of Rubber Reclaimers Association, Inc.; Jean H. Nesbit, president of U. S. Rubber Reclaiming Co, Inc.; C. R. Shaffer, president of Xylos Rubber Co.; Clark Harrison, president of Bloomingdale Rubber Co.; and W. J. Geldard, of Naugatuck Chemical Division, U. S. Rubber.

The representatives of the reclaimers stressed the point that there is no conflict between reclaimed and synthetic rubber. The brief submitted by the board of directors of the Rubber Reclaimers Association stated: "The members of the Rubber Reclaimers Association did not in 1940, and do not in 1947, view with alarm development of a synthetic rubber industry in the United States."

The directors declared in favor of a stockpile of natural rubber. They also pointed out that there is at all times within the country a useful stockpile of more than 1,000,000 tons of rubber in the form of scrap which is immediately available and can be returned to the rubber goods industry at a rate of 300,000 tons a year, but that this stockpile loses its security value in the event the reclaiming industry is not preserved. For this reason the directors expressed their belief that "no legislation should be enacted which would destroy or weaken the rubber reclaiming industry."

Individual members of the Association were more outspoken in expressing their personal opinions.

Declaring that his company "is not opposed to the compulsory use of synthetic rubber . . . if such compulsory use is required for the attainment of national security," William Welch went on to add that, "We feel that any and all federal legislation, which in time of peace, limits the freedom of American manufacturers in a choice of raw materials is repugnant to every American who believes in a free society as opposed to a controlled society."

Mr. Welch declared that in his opinion "the most startling fact . . . in regard to proposed legislation is that we almost automatically start with the premise that the legislation will contain a provision for the required use of synthetic rubber in certain articles. Every meeting . . . has been devoted to a discussion of *how much* synthetic rubber will be legislated into rubber products and what products will carry this legislated synthetic rubber. . . . To my mind it is just as bad to legislate a little bit of synthetic rubber into tires as it is to legislate a large amount. I am unalterably opposed to any legislation limiting the right of the American rubber compounder to develop the best product his ingenuity and skill can devise unless it can be completely proven that such legislation is essential for our national security. . . . No such evidence has yet been presented, and until it is presented our company is opposed to the required use of any compounding ingredient in the manufacture of any rubber article made for consumers except the Federal Government."

Mr. Welch also stated a belief that compulsory use is the wrong way to promote consumer acceptance of tires containing synthetic rubber. "Forced acceptance at best will be reluctant and will last only so long as required use legislation remains on the statute books. . . . The Midwest Rubber Reclaiming Co. sees nothing prejudicial to its interests in having a large amount of synthetic rubber consumed in American rubber products. I strongly believe that the permissive instead of compulsory use of synthetic rubber is the road toward a healthy synthetic rubber industry in America. . . . To this end I would like to see the government get out of the business as soon as possible and have the plants sold to private companies. . . . When these plants are owned by private industry, we will witness a competition between these synthetic rubber producing companies in the best American tradition. Better general-purpose synthetic rubber is bound to result."

Jean H. Nesbit pointed out that the "hidden stockpile" of reclaimable goods plus a healthy rubber reclaiming industry saved us at the start of the last war.

"In making plans for the protection of synthetic rubber," Mr. Nesbit stated, "it would be wise to consider how these will affect reclaimed rubber, for should there be another emergency, a healthy reclaimed rubber industry will prove just as essential. . . . We do not think we should be asked to compete with a government subsidized raw material. Enforced usage is just as much of a subsidy for Butyl and GR-S as is a bounty of so many cents per pound paid to the manufacturer or user. Mandatory compounding would probably be confined to passenger-car tires because these offer an easy solution. We cannot feel happy about a solution which may have the effect of crowding out considerable of the potential reclaimed rubber that could be used in that product. Recent figures indicate this segment of the rubber goods manufacturing industry represents about 40% of the total consumption of reclaimed rubber."

Mr. Nesbit concluded, "The synthetic rubber plants served a tremendously useful purpose in helping win the war. No one questions the need of keeping the majority of these in standby condition so that their product will be available on short order in another emergency. . . . I feel strongly, however, that the portion of that capacity which is operating should stand on its own feet and that the product should be sold at its cost plus a profit while the plants are operated by the government."

Carl Shaffer also declared himself opposed to any subsidy for synthetic rubber because it would be a hardship to the reclaimed rubber industry.

The second of the two public hearings, held in the Akron City Hall on November 15, supposedly was to be devoted to hearing the proposals of the major Akron rubber companies on the subject of permanent rubber legislation. None of these companies was ready to talk; the reason given was that the time of the hearings had been advanced a week, and their respective statistical groups consequently did not have their studies completed. These companies now expect to present their combined views to the committee in Washington, December 1.

Before adjourning, Representative Shafer said that the chief concern of his committee was the continued operation of at least a part of the $750,000,000 synthetic rubber industry in the interests of national defense.

"If the government doesn't operate the plants, we want to find a way of disposing of them to private companies so as not to create a monopoly that would hurt the smaller firms. Our objective is to get away from all federal controls. We will try to write legislation that will more or less blanket the industry. It will be a sort of framework in which the plants can operate. We don't want to continue having the government telling manufacturers how much synthetic rubber they must use in certain products. Rather we hope to compel industry to use only a certain amount to maintain and operate the synthetic plants efficiently. We hope the Akron industry will bring a completed plan to Washington, so we will know just what they think should be done with our nation's synthetic rubber industry. If they don't, we will have to go ahead without them."

The Washington Hearings

At Washington, D. C., on December 1, A. L. Viles RMA president, appeared before the Shafer subcommittee and recommended a continued government rubber control program as basic to national security. In a prepared statement, it was pointed out that a recently completed industry study of the probable quantitative aspects of national security in rubber gives the following suggested direction for a coordinated rubber program during the foreseeable future.

1. The accumulation of the strategic stockpile of natural rubber (as provided in Public Law 520 of the 79th Congress) is of paramount importance to achieve the measure of protection necessary to meet the probable requirements for natural rubber in event of an emergency.

2. To acquire the natural rubber stockpile in the shortest practicable time it is necessary to continue the use of synthetic rubber at substantially existing levels (about 40% GR-S).

3. During this period, prior to stockpile accumulation, the quantitative security position is most dangerous, requiring greater reliance on synthetic rubber for meeting the needs of any possible future emergency.

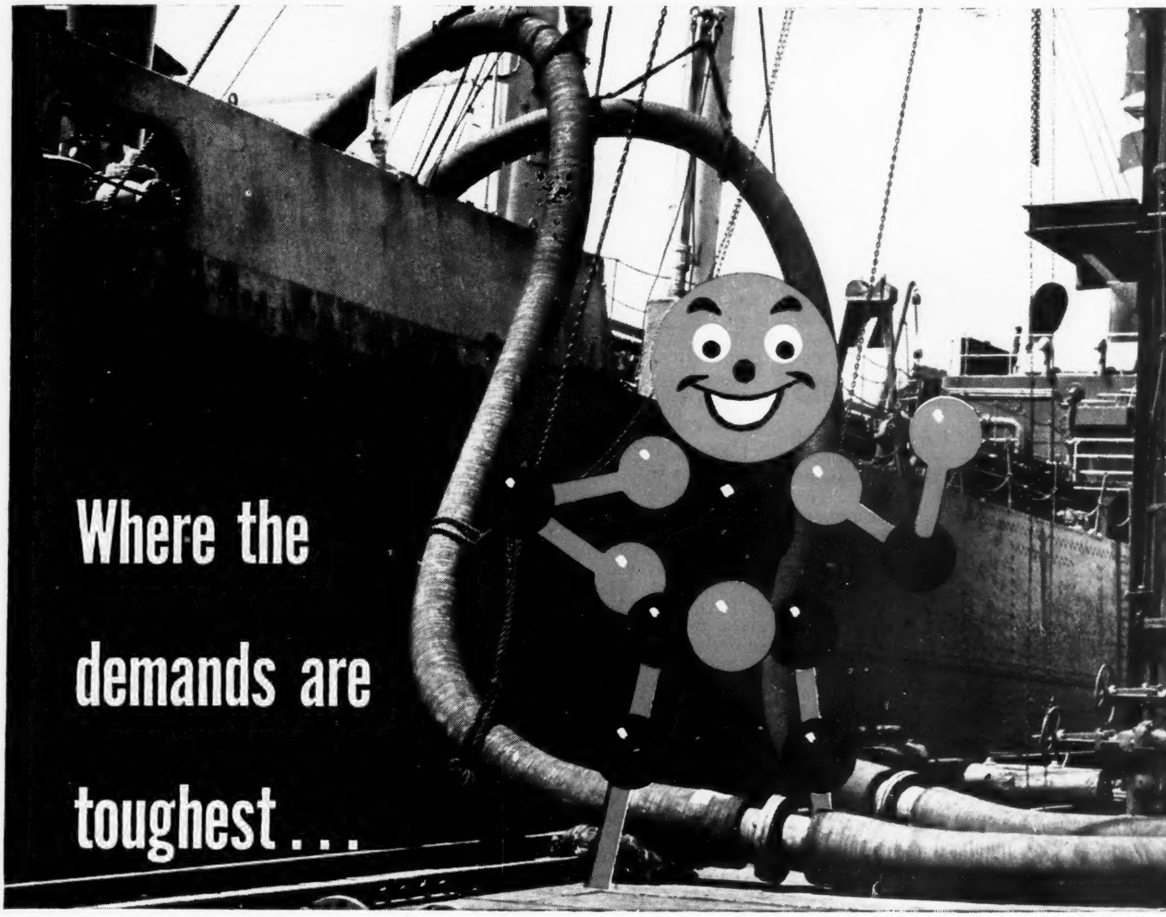
4. In addition to, and concurrent with, stockpiling natural rubber, a program of stockpiling GR-S will give the additional measure of protection that might prove necessary.

In the light of these things and the paramount fact that national security requirements are not fixed and static, but dynamic and ever changing owing to fluid world conditions, the committee was told that the industry group strongly supported five basic recommendations with respect to national rubber policy, as follows:

1. Congress should enact legislation to replace Public Law 24—80th Congress, to be effective from April 1, 1948, to March 31, 1949, such legislation to provide for continued controls over rubber consumption and the importation of rubber products, as now contained in Public Law 24 and modified as required by the following additional recommendations.

2. Congress should designate the National Security Resources Board (NSRB) as the agency of government responsible for all policy decisions for administrating the rubber legislation which has its foundation in national security.

3. To make certain that the synthetic rubber producing facilities are held in constant readiness against a possible nearby emergency prior to the substantial accumulation of a natural rubber stockpile, it may not now be in the interests of national se-



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curity to make final provisions for the disposal of such facilities to private interests. The legislation should not prohibit the sale or lease of such facilities to private industry and should permit decision by the NSRB as to whether the disposal of any facility is consistent with national security.

4. RFC, or its successor, should be continued as the agency responsible for the operation of the synthetic rubber facilities including employing operators, procuring the raw materials, and selling the product. The selling price of synthetic rubber produced in these plants should be based upon realistic and fair costs, determined by definitely established accounting principles. Research and development sponsored by this agency should be carried on for cost reduction and for the purposes within the scope of the technical agreement dated December 19, 1941, as may be modified from time to time.

5. The Department of Commerce should be continued as the agency for administering the Rubber Order R-1 regulations issued pursuant to the legislation. The overall ratio of synthetic rubber consumption, as may be determined from time to time by the NSRB as adequate for national security, should be implemented by the Department of Commerce in cooperation with existing Industry Advisory Committees.

With reference to strategic tonnage, the manufacturers urged a stockpile ranging between 300,000 and 800,000 long tons of rubber, depending upon the continuing rate of consumption of synthetic rubber, the size of stocks of GR-S, and other factors. They also recommended that the government keep in operation or standby a total capacity of 600,000 tons of general-purpose synthetic rubber including 60,000 tons of Butyl rubber. It is assumed that private enterprise will keep in being the necessary capacity for neoprene and nitrile-type rubbers.

With world demand running ahead of supply, it was pointed out that rubber manufacturers urged with great emphasis the importance of close industry cooperation with government in any stockpiling operation to avoid placing undue pressure on the world market.

Pointing out that rubber manufacturers in this country are devoting more than 33 million dollars a year to rubber research, employing in their vast new laboratories more than 5,500 trained scientists and technicians, the industry recommended limiting government activities in this field to their present scope.

It was noted that two opinions were held in respect to disposal of the government owned synthetic plants. On one hand, the view is held that the development of a free synthetic industry will be best promoted by permitting the NSRB to exercise discretion relative to disposing of the synthetic plants on enactment of legislation. Another part of the industry holds that the exercise of this discretion should be deferred until security pressures have been relieved and a program for complete disposal developed.

In strongest terms the industry urged that any law passed in this connection should be made subject to periodic review at each session of the Congress until a final program on synthetic rubber can be established by the Congress.

John L. Collyer, Goodrich president, supported the RMA statement in principle, but differed on several recommendations. He recommended extension of the present legislation for two years, the immediate termination of the patent pooling and the information exchanging agreement, and reduction of mandatory consumption from the existing level.

J. P. Seiberling, president of Seiberling Rubber Co., told the Shafer committee that he opposed private ownership of the synthetic rubber plants as long as the government requires mandatory use of synthetic rubber. Specifically he recommended that the proposed legislation prohibit sale or lease of the plants to private interests for one year, or until the emergency stockpile is completed. He asserted that Seiberling and certain other companies which could not afford to buy the synthetic plants would be forced to buy synthetic rubber from competitors if the plants were sold while the government still required some synthetic in tires.

More complete information on these hearings will be reported next month.

Crawford's Proposed Bill

Lockwood's November *Rubber Report* included a copy of a bill proposed by Representative Crawford, author of Public Law No. 24 of the 79th Congress, the interim legislation under which the government's rubber program is operating at present. This proposed bill would make the National Security Resources Board of Public Law No. 253 of the 80th Congress the top administrative group "to supervise and coordinate programs of departments and agencies of government which pertain to national policy on rubber."

Use of synthetic rubber in amounts of "at least one-third of the aggregate weight of rubber used in any calendar year by any manufacturer in the manufacture of pneumatic tires in sizes 8.25 cross-section and under; tractor and implement tires; and/or camelback" is recommended. The amount of synthetic rubber may be varied in each of the above categories, but a minimum of 5% of synthetic rubber shall be used in each category. Total active and standby capacity shall be at least 600,000 long tons per annum. With the transfer of synthetic rubber production to private industry, "primary responsibility for synthetic rubber research should rest with private industry," it is stated. The Security Board is given the problem of determining how much government-sponsored fundamental research is necessary.

The synthetic plants are to be disposed of within 90 days after the bill becomes law; purchasers shall be free from any action under the "anti-trust laws," and the Surplus Property Act of 1944, as amended, shall not be applicable to the disposal of these plants. Purchasers or lessees must agree to operate the plants for the production of synthetic rubber, or of a material from which synthetic rubber is produced, and if the plants are not operated to capacity, they must be maintained in a proper standby condition. The plants are subject to recapture by the government if the purchaser of lessee fails to follow the above requirements.

Standby facilities not required for producion of the basic national security minimum of synthetic rubber to be determined are to be maintained by the Federal Works Agency or by private purchasers or lessees. The latter may not use the facilities for the production of synthetic rubber, and they must be available in 120 days for the manufacture of synthetic rubber.

All patent agreements relating to synthetic rubber and agreements for the exchange of information relating to synthetic rubber are to be terminated within 30 days after the enactment of the bill.

Twelve months after the bill is passed, the government is to be completely out of the business of producing synthetic rubber unless the Security Board decides otherwise.

Penalties for not following the law, if passed, consist of a fine of not more than $10,000, imprisonment for one year, or both.

The U.S.-U.K. Trade Agreement

Information concerning the conditional trade agreements made between various nations at the recent meeting of the International Trade Organization in Geneva, Switzerland, were made public on November 18. Of greatest interest to the rubber industry was the proposed agreement between the United States and the United Kingdom on the production and use of natural and synthetic rubbers. The section on natural rubber has such rubber on the free list, and in addition under the most-favored-nation tariff terms states:

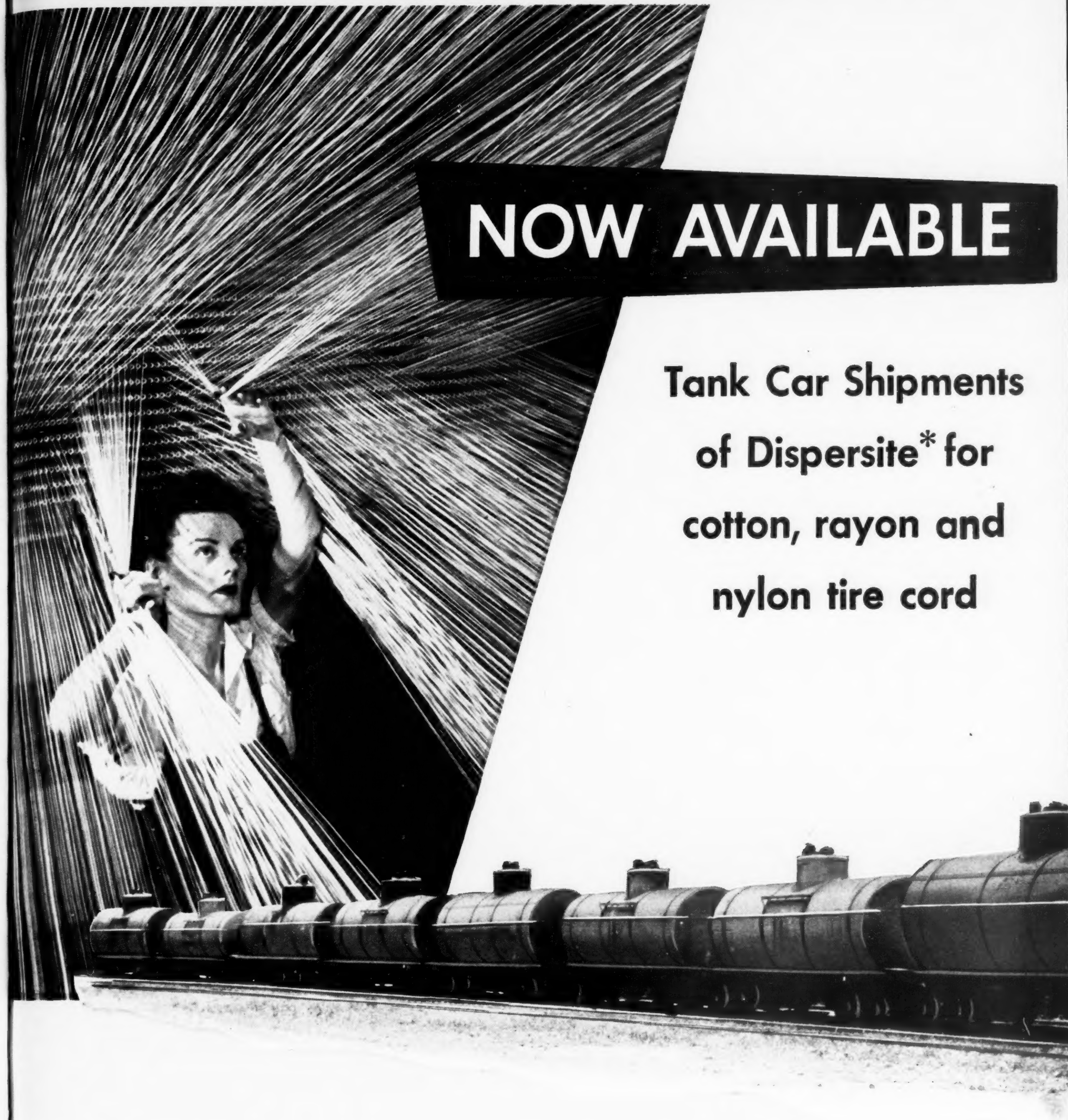
"1. In each of the territories (except Ceylon) named in Schedule III of the Trade Agreement between the United Kingdom of Great Britain and Northern Ireland and the United States of America, signed November 17, 1938, the margin of preference, if any, on any product listed in that Schedule in respect of such territory, shall not exceed three-fourths of that existing on April 10, 1947, or 25% ad valorem (or a margin of specific or other duties equivalent to 25% ad valorem), whichever margin is the smaller. *Provided* that this undertaking shall not require the reduction of the margin of preference on any product to less than 2% ad valorem (or a margin of specific or other duties equivalent to 2% ad valorem). The Government of the United Kingdom, in association with the Government of the territory concerned, will, if requested, consult with any contracting party having substantial interest in any product concerned, and, should it prove impossible in any particular case to give effect to the reduction in a margin of preference required by this undertaking, will agree on measures designed to provide an equitable solution.

"2. The reduction of preference provided for in paragraph 1, above, shall come into effect at the earliest practicable date and in any event not later than December 31, 1949, but may be made inoperative during the whole of any calendar year which immediately succeeds a calendar year in which the quantity of general-purpose synthetic rubber required to be consumed in the United States of America under internal quantitative regulations applied pursuant to paragraph 4 of Article III of the Agreement exceeds 25% of the total consumption in the United States of America of natural, synthetic and reclaimed rubber."

With special reference to the second paragraph of this quoted extract from the trade agreement, it is designed to be workable if the one-third synthetic, two-thirds natural rubber policy at present in effect is continued. Any change in that policy, if written into the long-term legislation before March 31, 1948, however, might change this situation.

Natural Rubber Supply and Price

The reduction in the consumption of both natural and synthetic rubbers in the United States, which began in May and reached its low point in July, and the accompanying slump in the price of natural rubber from about 23 to 13¢ a pound, has produced a situation at present in which there is insufficient natural and synthetic rubber to supply the demands of



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rubber goods manufactures in this country. The expected increase in the availability of natural rubber from Indonesia has not materialized; buying for the strategic stockpile by the United States has at least psychologically influenced the market, and the result has been an increase in price of natural rubber to about 23¢ a pound.

Except for the production of GR-S, the natural rubber price might have gone higher. An increased production of this rubber is planned as evidenced by the October 30 memorandum of Office of Rubber Reserve requiring orders more than three months in advance of delivery. Not only will ORR require at least 60 to 90 days to realize any increased production of GR-S of benefit to rubber goods manufacturers, but there is also a limit to the availability of styrene for any very great GR-S production increase soon.

Writing from London in Lockwood's *Report*, H. T. Karsten summarizes the natural rubber market picture as follows:

"There are only small free and available stocks in the consuming countries, with the possible exception of the United Kingdom, and the surplus stocks in Malaya are gradually being reduced and may in fact now only be sufficient to cover hand-to-mouth requirements. An increase from Indonesia is really required at the moment, but all reports indicate that there is little chance of this happening for some time to come."

Arthur Nolan, Latex Distributors, Inc., New York, also writing in Lockwood's *Report*, first provides statistics on natural rubber latex imports, consumption, and stocks as follows:

1947	8-Month Total January-August.	September
Imports	9,801	464
Consumption	6,942	1,646
Stocks (end of month)	—	3,987

All the above figures are in long tons, dry weight. It is pointed out that the above government figures do not include stocks "afloat." Shipments from Malaya were 1,285 tons in July and 1,619 tons in August.

Mr. Nolan points out that the current market price of natural rubber latices, some 10¢ a pound higher than GR-S latices, precludes their use in certain applications where they found large prewar outlets. Two large prewar uses, tire fabric treatments and carpets and rugs, are not now using natural rubber latices because of their high cost compared with alternate materials. Attention was also called to the fact that market prices of natural rubber latices have held level and firm for several months despite the fluctuation in the price of solid rubber between 13 and 23¢ a pound, and that this differs from prewar practice of pricing liquid latices at the price of No. 1X smoked sheet plus a premium or differential.

The present price for solid rubber, if continued, would indicate the possibility of an increase in the price of latices, and although the opinion was expressed that this might not necessarily reduce the current level of consumption of latices, it might prevent their *wider* use. Thus present expansion of facilities for the production of natural rubber, a drop in price, and a detriment to any further expansion of producing facilities. All of which points to a price problem with very long-range implications wherein the desire for a low price to stimulate the highest consumption must be integrated with actual costs of production and distribution and the "greener grass" of other endeavors, Mr. Nolan concluded.

Warren Lockwood, himself, in his November *Report*, took the position that the natural rubber producing industry must bear in mind in relation to its own future that GR-S sells for 18½¢ a pound and could sell for less in private hands. The producing industry must bear in mind that the much-discussed 4¢ a pound differential between GR-S and natural rubber in the United States is proving to be an overstatement rather than an understatement. *The quality of GR-S is now considered better by United States manufacturers of rubber goods than many natural rubber producers permit themselves to believe.* (Italics are Lockwood's.)

Industrial Relations

The United Rubber Workers, CIO, has passed a resolution in favor of having its officers sign the non-Communist affidavits as required by the Taft-Hartley Law. Although condemning the law, the union has decided that failure to qualify would deprive the members of the ability to use the facilities of the National Labor Relations Board and that in such action the disadvantages outweighed the advantages. Goodyear Tire & Rubber Co., Akron, O., signed an agreement with local 2, URWA, covering conditions for employes at Plant C, the new latex foamed rubber and Pliofilm plant, in which an eight-hour day and a 40-hour week were included. Negotiations are still continuing between the URWA and the Firestone Tire & Rubber Co. and the General Tire & Rubber Co. in connection with the wage increase request of the union initiated some weeks ago. Other companies have reached an agreement with the union for six paid holidays in lieu of a wage increase, but the local union at Firestone seems determined on an actual wage increase, and the General Tire management is unwilling to make the holiday pay retroactive to last Labor Day.

The Non-Communist Affidavit

At the annual convention of the URWA in Boston, Mass., in October the delegates gave the executive board of the international union the authority to decide whether or not to comply with the Taft-Hartley Law with special reference to the signing of non-Communist affidavits by its officers. The executive board made public a resolution late in October in favor of complete compliance with the law. In this resolution the union first condemned the Taft-Hartley Law as "unreasonable, restrictive, hampers free collective bargaining, destructive of sound labor-management relations, and punitive by design" and stated that the URWA should "exert every legal effort to bring about repeal of the law or to secure adequate amendment to the law to protect the interest of labor," but since "the welfare of the URWA may be best protected by filling the necessary affidavits," the union has decided to follow this course.

The final paragraph of the resolution is of particular interest where it states:

"That we support to the fullest extent, legally possible, a program of the Political Action Committee to repeal the Taft-Hartley Act; that the international officers, local unions and our publicity department exert every possible effort to effectively bring to the attention of all organizations not affiliated with labor, the unfairness and unworkable aspects of the punitive and iniquitous law sponsored by the National Association of Manufacturers and other like organizations whose desire is to repress labor and to dominate the whole country for their own selfish gain at the expense of the American people."

The New Goodyear Plant C Contract

Because Goodyear's Plant C, in Akron, formerly the Goodyear Aircraft Corp. plant, but now being reconstructed for the manufacture of latex foamed rubber and Pliofilm, is in a state of development and because the union wants to keep the employment represented by this plant in Akron, a contract between local 2, URWA and the Goodyear company covering workers at this plant includes an agreement for a 40-hour week of five eight-hour days. This departure from the usual Akron 36-hour week and six-hour day was approved by the local union because "the union has seen a number of departments involving hundreds of jobs transferred to other cities." The company has agreed to extend to Plant C workers all the provisions of the company-wide contract of last February and the supplementary agreement of last May with the exception of the abovementioned work week and also the amount of the minimum wage. The minimum wage will be less than that paid in other Goodyear plants in Akron. All provisions of the new contract are subject to renegotiation when the contract expires June 1, 1948.

In negotiating the new contract the company told the union that the retail market for the products of Plant C is a highly competitive one and that it was necessary that the conditions of employment be such that it could successfully produce to meet this competition.

The Paid Holiday Contracts

Although many new contracts have been signed between local unions and the rubber companies for six paid holidays instead of a further wage increase at this time, no agreements have been reached between the Firestone Tire & Rubber Company and its local union nor the General Tire & Rubber Company and its unions.

It is understood that local 7, Firestone, at Akron, insists on a 12¢-an-hour wage increase and has asked officers of the international union to call together representatives of all the local Firestone unions for a conference on the matter.

At General Tire the company objects to making the six paid holiday agreement retroactive to last Labor Day based on the fact that since its pay rates are higher than those in most plants, the holiday pay would, in effect, be for more than six days a year.

Miscellaneous Good News Department!

Although our coverage is not 100%, we are pleased to call attention to the fact that during the month of November we did not receive one report of a strike, work-stoppage, sit-down, or disagreement resulting in a loss of production in the rubber goods industry. Under such conditions industry-wide production records are made.

Southern Alkali Corp., Corpus Christi, Tex., has appointed Charles E. Weeks assistant to Operating Vice President O. N. Stevens. A native of Runge, Tex., Mr. Weeks has been associated with Southern Alkali since its establishment in 1934. Prior to his new appointment, Mr. Weeks had served as auditor for the firm

EASTERN AND SOUTHERN

A. B. Farquhar Co., York, Pa., held a sales convention for its nation-wide organization on October 8 and 9. Preceding the convention, nearly 1,200 employes and friends of the company attended the fourth annual banquet at the Valencia Ballroom on October 7. Speaker at the banquet was Company President and General Manager William J. Fisher on the subject of "Stewardship." Nearly 200 Farquhar sales representatives attended the two-day sales convention. On October 8, E. H. Fisher discussed general policies and introduced the various company sales managers who in turn spoke of plans for their respective divisions. The different divisions also met in separate meetings to discuss new ideas, new equipment, advertising and other problems. October 9 was devoted to a review of the company's equipment on display at the York Fair Grounds.

H. C. Bugbee, recently returned from London where he had been acting as commodities attaché to the American Embassy for the past three years, has joined Warren S. Lockwood, foreign trade consultant, Washington, D. C. Mr. Bugbee will also act as co-editor of Lockwood's monthly "Rubber Report." Previous to his London assignment, Mr. Bugbee had been in charge of the sales division of Rubber Reserve Co. for two years. For the preceding 14 years, six of which were spent in the Far East, Mr. Bugbee was manager of The B. F. Goodrich Co.'s crude rubber purchasing department. He also served as a member of the United States Delegation to the International Study Group meetings in Washington, London, The Hague, and Paris, and as an American delegate to the International Tin Study Group meetings in London and Brussels.

Koppers Co., Inc., Pittsburgh, Pa., has named to the newly created post of assistant general manager of the chemical division B. J. C. van der Hoeven. He has been with the company since 1926 when he entered the research department. He has since successively served as operating engineer, operating superintendent, and general superintendent of the operating department of the engineering and construction division. In 1942 Mr. van der Hoeven was named manager of operations of the Kobuta, Pa., styrene and butadiene plant built and operated by Koppers for the government, where he remained until early 1946, when he became chief of the Kopper's chemical engineering department, engineering and construction division.

Hewitt-Robins, Inc., Hewitt Rubber Division, Buffalo 5, N. Y., has appointed Industrial Supply Co., Minneapolis, Minn., distributer of the entire Hewitt division's line of industrial hose, belting, and packing, to cover Minneapolis, St. Paul, Minnesota, and North and South Dakota. Industrial has a sales force of ten trained supply men, each with extensive industrial service experience. Company officers include E. E. Rampfer, president; V. W. Olson, vice president; and W. O. Hansen, secretary and treasurer.

A similar distributer appointment was that of Industrial Equipment Co., Louisville, Ky. William A. Mivelaz is owner of the company.

Foresee More Use of Rayon

Industrial applications will soon call for even greater quantities of rayon than they consume now, according to the textile research department of American Viscose Corp., Marcus Hook, Pa. The biggest industrial consumer is the tire industry, which today takes a fourth of all domestic rayon production. The rubber companies are also extending the use of rayon fabric to a variety of other rubber goods, such as belting, hose, diaphragms, and overshoe linings. Rayon yarn is also made into pump packings and protective tubing for electric wires. Rayon cord and rope is utilized for specialty applications, and large quantities of rayon fabric are consumed by the automobile industry for linings and upholstery.

One of the newest and most promising industrial uses of rayon is in non-woven fabrics. These are fibrous webs of viscose rayon staple to which a bonding agent, such as resin emulsion, latex, plastic fibers, and others, has been added. Rayon flock is used to make "felt" for phonograph turntables and other applications. Here the flock is attached to a backing of paper, glass, metal, wood, wallboard, or fabric by means of a suitable adhesive, such as a plastic latex or a casein glue. Woven and non-woven rayon fabrics and fibrous rayon mats have been used experimentally in making laminated plastics, and some products are expected to be on the market soon.

Pennsylvania Rubber Co., Jeannette, Pa., through President Howard Jordan recently announced the promotion of Robert Baumgardner to the position of advertising manager. Prior to this appointment, Mr. Baumgardner had been with the advertising department of The General Tire & Rubber Co., Akron, O., of which Pennsylvania Rubber is a division. A native of Lakewood, O., Mr. Baumgardner was graduated from Kent State University in 1936 with a degree in journalism. After being employed by the *Akron Times-Press,* he was with Seiberling Tire & Rubber Co. from 1938 to 1942 in advertising. After serving with the air forces during the war, Mr. Baumgardner was discharged in November, 1945, subsequently employed by an Akron advertising company, and joined General Tire's advertising department in April, 1947.

Pennsylvania has announced the development of a compression safety tube which company President Howard Jordan claims to be the foremost improvement in the passenger tire tube field in many years. Patented under the name of Air Lock Safety Tube, the tube was unveiled for the first time at a private showing during the recent national convention of the National Independent Tire Dealers Association at Cleveland, O., and was favorably received. When a puncture occurs, the squeeze-action of the tube forces the rubber pores tightly together, causing the rubber to grip tightly round the puncturing object, Mr. Jordan explained. An extra safety feature of the tube is a venting design providing a means for trapped air to travel to the valve stem and be discharged. The standard inner tube has a fairly smooth exterior surface, Mr. Jordan explained, and, when put into the tire casing, offers little means of escape for trapped air. Too often this trapped air works through the casing causing ply separation and ruining the tire. The venting channels provided by the new tube eliminate this danger. Full-scale production of the new safety tube in all sizes will begin immediately, Mr. Jordan said.

Pennsylvania Rubber's New Air Lock Safety Tube

Manhattan Rubber Division, Raybestos-Manhattan Inc., Passaic, N. J., was the scene of an industrial medicine clinic recently when the plant was host to a group of New Jersey physicians during the fifth clinical conference of the New Jersey Section, American Medical Society. The group was welcomed by John H. Matthews, company vice president, and Plant Physician J. M. Keating gave a lecture on "Infections and Injuries of the Hand." The group inspected several factory departments where safety devices for machines were demonstrated and discussed. A highlight of the clinic was an inspection of the company's 14-room plant hospital, which is considered the most modern in the state.

Four hundred foremen, supervisors, officials, and their wives, representing the production management of Manhattan, attended the third annual dinner for company foremen at Donohue's Inn, Mountain View, N. J., on November 2. Welcoming the gathering was Mr. Matthews, and Personnel Manager Dennis J. Fenelon acted as toastmaster. The committee in charge consisted of Mr. Fenelon, H. V. Snyder, E. W. Kazimer, C. A. Anderson, J. J. De Mario, R. T. Griffith, and N. Finch.

Sun Oil Co., 1608 Walnut St., Philadelphia 3, Pa., has appointed Storrs J. Case advertising manager, according to Samuel B. Eckert, vice president in charge of marketing. Mr. Case will direct all of the company's advertising. Fred S. Cannan will act as assistant manager in charge of motor products advertising; while Laurens H. Fritz will act as assistant manager in charge of industrial products advertising. Mr. Case, a native of Detroit, has been in advertising or sales promotion in the automotive field for 24 years. Until recently he owned and operated a tire distributership at Van Nuys, Calif.

War Assets Administration, Washington, D. C., in its recent listings of surplus materials for sale included hose, chemicals, plastics, barage balloons, tires, automotive equipment, arctics, wire, and cable.

Closing Institute Plant; U. S. Rubber Personnel Changes

United States Rubber Co., Rockefeller Center, New York 20, N. Y., last month announced termination of production at the government synthetic plant it has operated for the past 4½ years in Institute, W. Va. Special grades of GR-S rubber previously produced at Institute, including black types and non-staining types, will henceforth be made at the plant operated by U. S. Rubber in Borger, Tex., it was stated. Some of the special plant equipment for making black GR-S will be moved to Borger.

Virtually all supervisory personnel has been or will be transferred to the company's other plants. Plant maintenance personnel will remain at the plant for about six months to pack machine parts in preservatives and place the plant in a stand-by condition. Most other wage employes have been invited to join the maintenance crew in this work.

P. E. Rice, plant manager, will remain at the plant to supervise the work of putting the plant in stand-by. The job will be done according to the standard procedure approved by the government's Office of Rubber Reserve. It will include disassembling the machines and coating the parts with corrosion resistant agents. Insofar as possible, outdoor equipment will be moved inside.

The Institute plant, the first large synthetic rubber unit to start regular production of the critical war material, went into operation on March 31, 1943. When production ceased November 10 this year, output had totaled 358,537 long tons, an amount equal to the annual output of 600,000 acres of high-producing natural rubber trees. During periods of peak production the plant employed approximately 1,400 people. By the time the plant closed the payroll had decreased to 500.

During the war the plant used butadiene made from alcohol at a plant in Institute adjacent to the rubber plant. When the government decided after the war to use only butadiene made from petroleum, the nearest sources of supply to Institute were in Louisiana and Texas.

Herbert E. Smith, president of U. S. Rubber, announced that the company has signed an agreement permitting the Richfield Oil Corp. to drill for oil at the site of its tire factory in Los Angeles, Calif. The grant is effective for 20 years and provides for the payment of a royalty to the rubber company on all oil and natural gas produced. Although rights are granted to all oil reserves below the surface of the factory's 35-acre tract, the tire plant will not be disturbed since slant drilling will be employed.

The shoe products sales department of U. S. Rubber was transferred from New York to the company's plant in Providence R. I., on November 15. According to A. C. Grimley, departmental sales manager, the move was made to permit more efficient coordination of production and distribution. Department members who accompanied Mr. Grimley to Providence included A. S. Bannister, manager of shoe factory sales; James O. Smith, manager of jobbing sales; and J. J. Savage, sales assistant. Chief products of the department are rubber heels and soles, fiber midsoling and innersoling, and shoe cements.

Executive Changes

J. E. Rutter has been made sales development manager of the Lastex yarn and rubber thread division. Mr. Rutter started his career with the company 27 years ago. From 1928 to 1941 he served the footwear division as district sales manager at Omaha, Detroit, and Boston. At the outbreak of World War II he was appointed manager of the eastern section, war products division, in which capacity he directed war exhibits in Washington, New York, and Detroit. Since the war Mr. Rutter has been specializing in the development of a farm market program. At the time of his new appointment he was serving in the advertising department as manager of sales and market promotion.

Clarence H. LeVee has been made manager of electric utility sales by the wire and cable department, to be responsible for the sale of wire and cable to electric light and power companies. His headquarters will be in the company's general offices in New York. Mr. LeVee was graduated from Rensselaer Polytechnic Institute in 1924 with a degree in electrical engineering. He has held important postions with Depew & Lancaster Light & Power Co., Central Hudson Gas & Electric Corp., Ford, Bacon & Davis, and Fagan Electric Co. In the early days of the late war he was superintendent of electrical construction for the Arkansas Ordnance plant. During his stay in Arkansas he was a member of the State Licensing Board and president of the Little Rock Engineers' Club. Later he supervised electrical construction at other important military installations. Then in 1943 he enlisted in the Navy Seabees and spent 19 months overseas with the rank of lieutenant commander. Mr. LeVee is a licensed professional engineer and a member of the American Institute of Electrical Engineers.

Gregg T. Ward, branch sales manager of the company's footwear division, has announced the appointment of three new district sales managers: John C. Miller, Detroit branch; Richard C. Emmons, Denver branch; and Ralph D. Wheeler, New Orleans branch. Each manager will be responsible for footwear, clothing, and Koylon foam rubber sales in his branch territory.

Mr. Miller started with U. S. Rubber Company in 1943 as a salesman in the Denver district, later being transferred to the Seattle district as salesman. In May, 1947, he became the district manager's assistant at Seattle.

Mr. Emmons' first assignment with the rubber company in 1936 was with the foam rubber division. After a military leave from August, 1941, to January 1, 1946, he was made the district manager's assistant in the Chicago branch.

Mr. Wheeler has been a salesman in he Atlanta branch since 1938, except for two years, 1942 to 1944, at the Charlotte Ordnance Plant.

Sherman I. Strickhouser, factory manager at the Providence, R. I., plant, on November 15 announced several changes in the executive set-up there.

Edward J. Cooney, formerly superintendent of the golf ball department, has been made general superintendent, in charge of the battery separators, soles and heels, golf balls, dipped goods, card cloth, sundries and specialties, blankets and cut thread departments. His successor in the golf ball department is Berton F. Webster, superintendent of the soles and heels department, a post now held by Alfred B. Wilkes, formerly second-shift night superintendent. That position has been assigned to Albert Patunoff, a foreman in the Lastex department.

Wm. E. Howe, in charge of scrap control, became superintendent of the cut thread department; while James A. Coleman has been advanced from supervisor on the first shift at the Newport, R. I., plant to superintendent of the plant.

R. H. Gerke, development manager at Providence, has been transferred to the research and development division at Passaic, N. J., on tire research and development. Succeeding Dr. Gerke at Providence is Ernest J. Joss, who returns to the plant after six years, when he had been assistant development manager. During the war Dr. Joss was at the Des Moines Ordnance plant, operated for the government by U. S. Rubber, serving successively as assistant technical manager, technical manager, and factory manager. Following cessation of hostilities Dr. Joss went to the general manager's staff at company headquarters in New York on special assignments.

H. B. Humphrey, formerly salesman for Fisk tires in the San Francisco district, has been appointed district manager at Portland, Ore. With broad experience in the tire business Mr. Humphrey joined Fisk in 1927 as a salesman in the Los Angeles territory, covering parts of the Pacific Coast and the Southwest. He was transferred to the San Francisco branch in 1934 as operating manager, and in 1940 joined the U. S. Tires division as assistant to the division manager at San Francisco. He joned the Fisk organization in 1944, handling sales in the San Francisco-Oakland, Calif., territory prior to his recent appointment.

With nearly a million units sold in its first year of production, the low-pressure tire made by U. S. Rubber has set a record for the number of special tires sold within a single year, J. C. Ray, U. S. Tires sales manager, recently told a dealer council meeting in Detroit, Mich.

"Introduced about a year ago as the industry's first postwar new type tire, demand is exceeding production." Mr. Ray stated, and the low pressure tire has proved itself in tests under all kinds of driving conditions.

The tire utilizes the principle of increased air capacity at lower air pressure, which results in greater riding comfort. Besides improving car performance in general, the low pressure tire will help save wear and tear on the average automobile because of its softer riding quality, Mr. Ray added.

The dealer council was attended by company dealers from all parts of the country. The meeting was held as part of a long-established company program to bring dealers together for an exchange of ideas, a discussion of sales problems in their particular areas, and for formulation of policies for the ensuing year.

Enjay Co., Inc., recently moved to its new quarters in the Esso Bldg., 15 W. 51st St., New York 19, N. Y.

Allied Chemical & Dye Corp., 61 Broadway, New York, N. Y., has announced that its subsidiaries, The Solvay Process Co. and Solvay Sales Corp., have been merged into their parent corporation. The businesses of the merged companies will be continued under the respective names of The Solvay Process Division, Allied Chemical & Dye Corp., and Solvay Sales Division, Allied Chemical & Dye Corp., with no change in personnel.

OHIO

B. F. Goodrich Chemical Co., 324 Rose Bldg., Cleveland 15, plans construction of a new manufacturing unit to produce adequate quantities of the agricultural spray material, Good-Rite polyethylene polysulfide (p.e.p.s.). The new unit will be installed in the company's plant in Akron. S. L. Brous, company sales development manager, says that the new facility will provide improved Good-Rite p.e.p.s. for easier handling by shipper and user. As much as one-half of the water included in the original p.e.p.s. dispersion is now eliminated. This advantage is a decided one to the user since it will no longer be necessary to premix the polyethylene polysulfide prior to incorporation in the spray mixture.

William I. Burt, Goodrich Chemical vice president, has been elected a director of the American Institute of Chemical Engineers.

Fawick Airflex Co., Inc., 9919 Clinton Rd., Cleveland 11, has appointed Richard Scott Huxtable executive vice president and general manager. Previously he had been assistant to the vice president and general manager of the Cleveland diesel engine division of General Motors Corp. Mr. Huxtable was born September 20, 1913, in Cleveland. After graduation from Western Military Academy, he attended the Wharton School of Finance and Commerce at the University of Pennsylvania. He was a cooperative student at the General Motors Institute, graduating in 1936, and completed his education in night classes at Case School of Applied Science and Fenn College, receiving his mechanical engineering degree from the latter in 1940. He is a member and past chairman of the Cleveland Section of the Society of Automotive Engineers, a member of the Society of Naval Engineers, the Society of Naval Architects and Marine Engineers, and president of the Cleveland Council of the Navy League of the United States. He is also an active member of the Newcomen Society of England, serving at present as associate secretary of the Cleveland Committee. Besides he is a trustee of Fenn College.

The Timken Roller Bearing Co., Canton, has transferred Sales Engineer William E. Bryden from the Chicago office to the Cincinnati office of the steel and tube division. He is succeeded at Chicago by Sales Engineer William T. Strickland. Mr. Bryden, who received a B.S. degree in metallurgical engineering from Case Institute of Technology, joined Timken in 1937 as an assistant in the metallurgical department and in 1940 became sales engineer for the New York district. Following the outbreak of war he served a year as a member of the steel division of the War Production Board. Then he joined the Navy in 1942, was discharged in March, 1946, and was assigned to Timken's Chicago office in May, 1946.

Mr. Strickland also received a B.S. degree in metallurgical engineering from Case. After graduation he was employed by the Superior Steel Co., and the Republic Steel Co. He became associated with Timken in 1946, after serving four years in the Navy, and completed a sales training course prior to his assignment to Chicago.

Admiral W. A. Fitch

Admiral Fitch Joins General

Admiral Wray Abrey Fitch, USN., retired, has accepted a vice presidency with the General Tire & Rubber Export Co., according to W. O'Neil, chairman of the board and president of the parent company, The General Tire & Rubber Co., Akron. Admiral Fitch, former superintendent of the Naval Academy at Annapolis, was retired from the Navy on July 1 from the position of special assistant to the Under Secretary of Navy, John Sullivan.

Wearer of 14 campaign ribbons, Admiral Fitch saw active service in both world wars. He was in command of all operations in the South Pacific, including the Army, Navy, and Marine Corps and the New Zealand forces. For his operations in the battle of the Coral Sea he received the Distinguished Service Medal, and he was awarded a second DSM and also a distinguished flying cross for his South Pacific achievements.

Previous to his 1945 assignment as superintendent of the Naval Academy, Admiral Fitch was known as the Deputy Chief of Naval Operations, and on this task he received the decoration of the Legion of Merit. He holds also the decoration of Knight Commander of the Order of the British Empire; the Legion of Honor and the Croix de Guerre, of France; and the Order of the Southern Cross, of Brazil.

General has associated plants in Mexico, Portugal, Venezuela, Chile, Canada, Argentina, and South Africa, and General Tire & Rubber Export has sales outlets in 138 countries. According to J. A. Andreoli, executive vice president, the export company proposes to do a world-wide business in all of General's products.

Larry M. Baker, one-time Akron University football and track star, has joined General Tire as manager of interplant technical service, according to A. W. Phillips, general manager of manufacturing. One of the first rubber chemistry majors to be graduated from Akron University, Mr. Baker has been active in the rubber manufacturing field for the last 14 years, following three years in artificial leather development work. He was manager of the technical division at the Mansfield Tire & Rubber Co., Mansfield, prior to his new appointment. His previous rubber industry experience includes tire compounding management as well as chemical development work. Mr. Baker is a member of the Division of Rubber Chemistry, A.C.S.

Goodrich Promotions

William W. Scull has been named general manager of manufacturing services of The B. F. Goodrich Co., Akron, it was announced last month by T. G. Graham, vice president. The engineering and factory service divisions, machine and process development department, works technical laboratory, traffic and inter-plant operations departments are in the group. Mr. Scull had been production manager of plants of B. F. Goodrich Chemical Co., Cleveland, for the last two years. A graduate in mechanical engineering from Cornell University, Mr. Scull joined B. F. Goodrich in 1929 and served in the purchasing and sales departments. When the rubber emergency arose, he was assigned to the company's engineering group which erected some of the largest plants in the government synthetic rubber program, with a total of 255,000 long tons' annual capacity. Mr. Scull was also chairman of the purchasing committee of rubber company representatives mainly responsible for obtaining material to build and equip the plants. He was named manager of the government plant operated by the company in 1944 and later was transferred to Louisville, Ky., as manager of the government plant there. He was sent by Goodrich to Harvard University to take an advanced course in business administration several years ago.

Harold J. Poole has been named manager of farm service tire sales for Goodrich. He had been assistant national service manager since 1943, in which post he is succeeded by James E. Carhart, manager of the fleet maintenance department. Mr. Poole, a graduate of Georgia Tech, joined Goodrich in 1933 and served in the physical testing laboratories three years. He was service engineer, territory manager, store manager, commercial salesman, and truck and bus tire representative in several districts before being assigned to Akron headquarters of the company four years ago.

Mr. Carhart's first job with the company in 1919 was record clerk. He later became operating manager for the truck tire sales department, truck and bus tire representative, and in 1941 was returned to Akron to organize the Army Training School conducted by Goodrich.

Ernest Hookway has been appointed operating manager of the recently created plastic materials sales division. Mr. Hookway, with Goodrich since 1936, for the past two years was a senior development man in the industrial products division.

P. W. Stansfield has been named manager of passenger-car tire sales of Goodrich's replacement tire sales division. He succeeds W. E. Ireland, recently appointed merchandise manager of International B. F. Goodrich Co. A graduate of the University of Akron, Mr. Stansfield entered the rubber industry in 1917 and joined Goodrich in 1936. For the past eight years he has headed the retail sales of farm tires.

Several changes in the Goodrich automotive, aviation and government sales division were made recently. Wayne Stewart has been transferred to the managership of the Tulsa district, where he succeeds J. Ellis Huffman, assigned to other duties. Mr. Stewart's post in the New York offices was filled by H. F. Bichsel, formerly manager of the sales promotion department, now under Myron W. Martin.

The first automobile tire has been produced in the recently completed plant of Vredestein, associate Goodrich company,

in The Hague, Holland, it has been announced from Akron. Opening ceremonies were attended by Netherlands industrial leaders and members of government including United States Ambassador Baruch.

Willard C. Gulick, president, International B. F. Goodrich Co., now on a European business trip, represented the Akron company at the opening ceremonies.

Recent figures compiled by Goodrich's truck and bus tire department estimate that more than 1,250,000 new trucks will be manufactured during 1947. Goodrich itself now manufactures 104 different sizes and types of truck tires. Of this number, 10 sizes and types cover approximately 78% of the replacement needs. A size and popularity listing for truck tires, based on industry-wide replacement sales for the first six months of 1947, is as follows: 8.25-20, 13.8%; 6.00-16, 12.4%; 7.00-20 10-ply, 9.7%; 7.50-20 10-ply, 9.6%; 6.50-16, 8.1%; 6.50-20, 5.85%; 9.00-20, 5.55%; 10.00-20, 5.5%; 7.00-15, 3.7%; and 7.00-16, 3.57%.

Firestone Tire & Rubber Co., Akron, will erect a store building at 4835 Lankershim Blvd., Van Nuys, Calif. The new outlet will cover an area of 69 by 212 feet and will cost $75,000.

Velon insect screening, manufactured and sold by Firestone Industrial Products Co., Akron, was featured at the recent National Hardware Show, held at Grand Central Palace, New York, N. Y. In the exhibit a screening expert demonstrated the ease of installing Velon screening; a young woman proved its strength by standing in the center of completed frames, and a motor-driven mechanism dropped a five-pound steel ball on a test screen at the rate of 14 times a minute. Another working model consisted of a mechanical figure which repeatedly pressed a finger into the plastic screening. Continuous research has improved Velon screening since the end of the war, and greatly expanded production capacity has made it increasingly available. It is provided in four colors, 11 widths, and two weights, and sold at prices said to be below that of copper or bronze screen cloth. Also demonstrated at the show was the new Firestone Velva-Flo, a faucet attachment which aerates the water and eliminates splashing.

On his thirty-fifth anniversary with the company, Lee R. Jackson, Firestone executive vice president, was presented with a service pin by company President Harvey S. Firestone, Jr. Mr. Jackson, who was born in Akron and graduated from the University of Akron, joined Firestone in 1912 as a tire salesman.

George Childs, formerly assistant western division manager for Firestone, has been appointed vice president in charge of tire sales for the Automotive Equipment Co., Portland, Oreg., and will also serve in the same capacity for L. A. Courtemanche, McMinnville, Oreg. The two firms are Firestone distributers.

Pharis Tire & Rubber Co., Newark, has made William M. Moser technical director. Mr. Moser previously had been a research chemist for the Standard Oil Co. of New Jersey, with headquarters in Akron, and had specialized in the synthetic field, working intensively on the development of Butyl products. During the war years he had been chief chemist of the Armstrong Tire & Rubber Co., Natchez,

Wm. M. Moser

Miss. Mr. Moser was born and raised in Switzerland and attained his chemical engineering degree at the University of Berne. He did post-graduate work in Zurich and Geneva and came to the United States in 1921. He is married.

The Hydraulic Press Mfg. Co., Mt. Gilead, on November 10 held a directors' meeting at which was accepted the resignation of Col. H. A. Toulmin, Jr., as board chairman, president, and general manager. Then Walter G. Tucker was elected chairman of the board, a post he had held from 1933 to 1945, following 17 years as president of the company. Paul C. Pocock, formerly vice president in charge of sales, assumes active direction of the company's operations, as executive vice president and general manager; while Warren R. Tucker, vice president of Commonwealth Engineering Co., Dayton, was named to the newly created post of vice president in charge of engineering and research at Hydraulic Press. The board took no action on a new president.

Goodyear Executive Changes

Appointment of Clark A. Failing as assistant managing director of The Goodyear Tyre & Rubber Co. of New Zealand was announced last month by H. L. Hyde, general counsel of The Goodyear Tire & Rubber Co., Akron. Mr. Failing served as assistant secretary, Goodyear Foreign Operations, Inc., since 1940 and will be succeeded in that post by Arden E. Firestone, with the Goodyear legal department since 1942.

Born in New York, Mr. Failing joined Goodyear in 1925 after graduation from Syracuse University where he received his L.L.B. degree. He has handled legal matters in connection with Goodyear's foreign operations since 1929 and, as assistant secretary, directed the legal activities of Goodyear's world-wide operations. He is married and has one daughter. Mr. and Mrs. Failing will probably leave for New Zealand early in 1948. They plan to establish their home in Wellington.

A native Akronite, Mr. Firestone studied at Akron University and was graduated from law school at the University of Michigan. A veteran of World War II, he returned to Goodyear late in 1945.

R. L. Miller has been named assistant patent counsel of Goodyear Tire & Rubber, it was also announced last month by Mr. Hyde. Mr. Miller moves into this position from that of resident attorney and assistant secretary at Goodyear Aircraft Corp., where he is replaced by G. F. Clayton, an attorney for the parent company. T. A. O'Brien was elevated to the position of supervisor of he chemical section of the patent department.

Born in Greensburg, Ind., in 1907, Mr. Miller was graduated from Purdue University with a B.S. degree in chemical engineering with the Class of 1928. He joined the staff training course at Goodyear Tire immediately after graduation. In March, 1931, he was transferred to the patent department, received his bachelor of law degree from Akron Law School in 1934, and became secretary to Board Chairman P. W. Litchfield in 1937. Mr. Miller was named resident attorney and assistant secretary at Goodyear Aircraft at the outset of its wartime expansion in March, 1941.

Mr. Clayton came to Goodyear as an attorney in April, 1934. He was transferred to Goodyear Aircraft's legal staff in May, 1942, to Aircraft's wartime plant in Arizona later that year, and back to the legal staff of the parent company in 1946. He holds and A.B. degree from Cincinnati Law School. He is a native of Indianapolis, Ind.

Mr. O'Brien attended the Massachusetts Institute of Technology and Georgetown University. He holds degrees of bachelor of science in chemical engineering and bachelor of laws, and he joined the legal staff of Goodyear Tire as a patent attorney in 1934. Previously he had been a patent examiner in the United States Patent Office, Washingon, D. C.

Hubert A. White has been appointed chief chemist at Goodyear's tire and mechanical goods plant in Sydney, Australia, it was announced by George K. Hinshaw, vice president and production manager of Goodyear Foreign Operations, Inc. A member of Goodyear's development department in Akron since 1945, Mr. White joined the company at its Los Angeles plant shortly after graduation from the University of California.

Allan Weber has been appointed special railroad representative in the eastern United States for Goodyear. With headquarters in New York, his assignment covers railroads on the East Coast and as far west as Cleveland. Mr. Weber succeeds R. B. Warren, recently named Pittsburgh district manager for Goodyear's mechanical goods division. Native of Lithopolis, O., Mr. Weber joined Goodyear in 1927, shortly after graduating from Ashland College. He has held sales posts in Philadelphia, Baltimore, Richmond, and Atlanta. During the war he served in the Pacific as a lieutenant-commander on special assignment for the Naval Bureau of Aeronautics.

Establishing a new all-time production record in the manufacture of pneumatic tires for motor vehicles, Goodyear's No. 2 plant in Akron on November 11 turned out the 25,000,000th tire made by the company since December 31, 1946, when the 400-millionth was produced. The tire, a white sidewall, 7.60-15 Super Cushion, brought the company's 45-year pneumatic tire production to the total of 425,000,000 units. By producing its 25-millionth tire of the current year in 10 months and 10 days, Goodyear has approximated a schedule of 2,500,000 motor vehicle tires a month for the year to date.

NEW ENGLAND MIDWEST

A. G. Spalding & Bros., Inc., Chicopee, Mass., has made J. Preston assistant manager of the rubber division. He will assist O. S. Savaria, who is in charge of production of golf balls, tennis balls, baseballs, basketballs, etc. Mr. Preston joined the company in 1926 at Chicopee and was sent to the factory in Australia in 1927. He was made manager of the factory in 1940, a position he held until his recent appointment.

Hodgman Rubber Co., Framingham, Mass., has appointed, as Southeast sales representative, Bill Crum of Atlanta, Ga. Mr. Crum, who saw service in the Navy during the late war, previously had spent 15 years with A. G. Spalding & Bros., Inc.

Acushnet Process Co., New Bedford, Mass., through Rubber Division Sales Manager K. P. Goodwin, has announced the appointment of Thomas C. Edwards as technical director. Mr. Edwards, who recently resigned as manager of technical service and sales in New England for Enjay Co., brings with him considerable experience in the druggists' sundries and mechanical goods fields. He spent 10 years in the research department and compounding laboratories of The B. F. Goodrich Co. and several years as technical superintendent of the Davidson Rubber Co. Mr. Edwards is a graduate in chemical engineering of Ohio Northern University and a native of Ohio.

A. W. Metcalfe, formerly with the "Contro" division of the Firestone Industrial Products Co., Fall River, Mass., has joined the sales organization of Percy A. Legge, selling agent for Firestone's "Contro" and bare rubber thread. Mr. Metcalfe will be headquartered at the Boston office, at 212 Summer St.

General Electric Co., Pittsfield, Mass., has announced that G-E silicone rubber gaskets are now being incorporated in chemical reactors used in the manufacture of G-E Glyptal alkyd resins. These gaskets do not adhere to metal; they withstand temperatures as high as 400° F. and maintain their original properties under high vacuum. Because of its excellent resistance to alcohol, phenol, aromatic hydrocarbons, and other solvents, the rubber is an effective gasket material for processing these chemicals. Use of the silicone rubber in the reactors for many months has proved that the gaskets will not harden or crack under the severe conditions to which they are subjected. Their use also eliminates the replacement problem encountered with natural rubber gaskets.

T. Norman Willcox has been made manager of the methods and equipment laboratory of the plastics division, chemical department; he had been section engineer of the laboratory since February. Mr. Willcox came to G-E in 1936 as a member of the student test course and joined the plastics division in 1938, where he was assigned to the engineering section. Then in 1942 he was transferred to the Taunton Works as a product engineer and the following year was brought back to Pittsfield as a development engineer in the methods and equipment laboratory.

Diatomaceous Earth Deposit

Eagle-Picher Co., Cincinnati 1, has announced the completion of a new plant fitted with the latest equipment to process diatomaceous earth to exacting individual product specifications for the rubber industry. Located at Clark, Nev., the plant will have a large capacity and is geared to handle tailor-made grades of diatomaceous earth, to be called Celatom. According to T. C. Carter, company vice president in charge of insulation and diatomaceous earth products, the Eagle-Picher deposit is sufficient for several hundred years' supply and is suitable for surface mining methods. Location of the deposit on the main line of the Southern Pacific Railroad permits economical and efficient shipping.

Because of the region's arid climate the bed moisture in the deposit is usually only 15-25%, as contrasted with 65% or greater encountered in some other areas. Air drying is consequently expedited, Mr. Carter explained. Intensive sampling and testing show the deposit to be remarkably pure and quite low in impurities, such as volcanic ash, clay, and sand, according to Henry Mulryan, Los Angeles geology and mining consultant.

The unique, flexible plant for grinding, classifying, and calcining the diatomaceous earth is said to be one of the most modern in the country. The air classification system allows for precision separation and classification to a degree not possible to maintain with screen, sieve, and mechanical methods. Flexibility of the equipment also makes possible the blending of various particle sizes into any desired combination. This permits Celatom to be processed to any specification, an important factor to the rubber industry.

The new diatomaceous earth division is part of the planned expansion program of Eagle-Picher. An organization of specially trained chemical engineers as field representatives will assist rubber manufacturers in fitting Celatom to their specific product or production methods.

Offering New Stock

Monsanto Chemical Co., St. Louis, Mo., on November 28 filed a registration statement with the Securities & Exchange Commission covering an issue of 250,000 shares of cumulative preference stock, series B, carrying a $4 dividend rate. This stock will be offered to the public in mid-December through an underwriting group to be headed by Smith, Barney & Co., New York, N. Y., at a price to be fixed by the board of directors. The stock will be redeemable during various periods at premium prices to be fixed shortly before the public offering date.

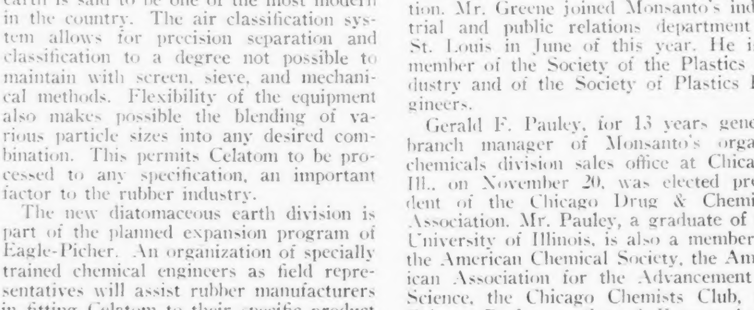
The proceeds of the issue will be used for the general corporate purposes of the company, including its expansion program. During 1946 approximately $23,500,000 was expended on capital additions and plant expansion, and approximately $27,000,000 was expended for the same purposes during the first nine months of 1947. The company contemplates a continuation of such expenditures.

As of October 31, 1947, the company had outstanding 4,233,503 shares of common stock, 101,390 shares of cumulative preference stock, series A (convertible into common stock), and $30,000,000 of 2.65% debentures due November 1, 1971.

Appointment of Edmund Greene as sales promotion and advertising manager of the Merrimac Division, Everett, Mass., was announced last month by Josiah B. Rutter, Monsanto vice president and Merrimac general manager. A graduate of Harvard University with an A. B. in chemistry, Mr. Greene worked for three years on Greater Boston newspapers. He was next employed for a year by Smith, Kline & French Laboratories and for eight years by Rohm & Haas. While with the latter firm he served as sales promotion manager of the plastics division, working on advertising publicity and product application. Mr. Greene joined Monsanto's industrial and public relations department at St. Louis in June of this year. He is a member of the Society of the Plastics Industry and of the Society of Plastics Engineers.

Gerald F. Pauley, for 13 years general branch manager of Monsanto's organic chemicals division sales office at Chicago, Ill., on November 20, was elected president of the Chicago Drug & Chemical Association. Mr. Pauley, a graduate of the University of Illinois, is also a member of the American Chemical Society, the American Association for the Advancement of Science, the Chicago Chemists Club, the Chicago Perfumery Soap & Extract Association, and the Chicago Association of Commerce. He has been with Monsanto since 1927, when he was employed as a chemist at St. Louis headquarters.

John J. Healy, Jr., assistant general manager, Merrimac Division, has been elected a director of the American Institute of Chemical Engineers for the next three years. Mr. Healy has been with the Division since 1921. The author of several papers on heavy chemicals, Mr. Healy has developed several patented processes for glycerin lyes, manufacture of pigmented paper, and liquid coating compositions.



View of Eagle-Picher Diatomaceous Earth Deposit at Clark, Nev.

Link-Belt Co., 307 N. Michigan Ave., Chicago, Ill., in order more directly to serve customers in the western portion of the lower peninsula of Michigan, has established a sales office at 406-7 Murray Bldg., 48 Division St., North, Grand Rapids 2, Mich. Peter Groustra, district sales engineer at Detroit, has been appointed district sales manager in charge of the new office. Mr. Groustra entered the company's employ in 1926 as a draftsman at the Pershing Rd. plant in Chicago, serving successively in the order and estimating divisions of the engineering department for 13 years. He was next employed three years in the Pershing Rd. sales department, but was transferred to the Detroit office as district sales engineer in 1943 and has since been serving customers in eastern and northern Michigan. Mr. Groustra studied mechanical engineering at Armour Institute of Technology and had been employed for a year as a draftsman for another concern before casting his lot with Link-Belt. In his new position he will be assisted by Herbert E. Wolf, a member of the staff of the Link-Belt Ewart plant in Indianapolis since 1934.

S. W. Koffler, formerly sales and sales promotion manager for the Loewenthal Co., manufacturer of rubber link mats and matting, has announced the establishment of his own manufacturing and sales organization to be known as the Koffler Sales Corp. The Loewenthal Co. recently dissolved and retired from the field. Mr. Koffler will continue in the manufacture of rubber link matting for industrial, institutional, and accident prevention purposes, as well as individual household mats. The Koffler factory and salesroom are located at 3757 N. Racine Ave., Chicago, Ill.

Chicago Rubber Products Co. recently transferred its offices and warehouse to 625 W. Jackson Blvd., Chicago 6, Ill.

Paisley Products, Inc., recently held its Midwest division sales meeting at the Stevens Hotel, Chicago, Ill., under the direction of Earl C. Lenz, manager of sales and service. Among those present were: W. O. Garwood, Harry S. Miller, Charles Perkins, Manny Phillips, Harry Speyer, David Bookshester, Vice President Murray Stempel, Technical Director Sam Schuller, Clarence Moser, Malcolm Robinson, Herman Liberman, Skilly Knox, Robert Carr, Woodrow Cochran, Charles Brooks, George Vanden, Harvey Schamp, J. P. Hennebberry, and C. D. Brown.

OBITUARY

Howard F. Parkerton, Sr.

HOWARD F. PARKERTON, SR., manager of The Farrel-Birmingham Co., Inc., sales office at Los Angeles, Calif., died on October 27, following an operation.

Mr. Parkerton was born in Redding, Conn., 62 years ago. He first became associated with Farrel-Birmingham in 1901 when he began as a machinist's apprentice at the Farrel firm at Ansonia. In 1920 he was employed at the company's Buffalo plant and in 1930 was transferred to the newly established Farrel-Birmingham sales office in Los Angeles. He was placed in charge of the office and retained that position until his death. During his long career he had also worked for a time for L. G. Henes, selling Farrel-Birmingham machinery.

An active member of The Los Angeles Rubber Group, Inc., he was well known within the rubber industry for his constructive help in the installation of plant machinery. During World War II he supervised the installation of propulsion gear units used by West Coast shipyards in ship construction.

Surviving Mr. Parkerton are the widow and a son, Howard, Jr., also employed in Farrel's Los Angeles office.

Henry N. Young

THE former vice president of the Hamilton Rubber Co., Trenton, N. J., Henry Newton Young, died November 5. At the time of his death he was vice president and advertising manager of the *New Jersey Compass*, published in his hometown of Princeton, N. J.

Mr. Young was born in Wilkes-Barre, Pa., on February 13, 1885. He was graduated from Amherst in 1907, after which time he did graduate work for a while at the University of Pennsylvania. Later, in 1912, he became a representative of the British-American Tobacco Co. in China. After two years he returned to this country where he became associated with Hamilton. Becoming vice president of the company in 1924, he retained this position until his resignation in 1943. On February 1, 1947, he joined the staff of the *New Jersey Compass*.

Funeral services, at his late home in Princeton, were on November 7, followed by burial at Princeton Cemetery.

His widow, two sons, and a daughter survive Mr. Young.

FINANCIAL

American Cyanamid Co., New York, N. Y., and subsidiaries. Nine months ended September 30, 1947: net income, $6,294,571, equal to $2.04 a common share, compared with $6,191,905, or $2.07 a common share in the same period in 1946.

American Zinc, Lead & Smelting Co., Columbus O., and subsidiaries. Year ended September 30, 1947: net profit, $1,211,349, equal to $1.29 a common share contrasted with $422,310, or 12¢ a common share, for the preceding 12 months; provision for contingencies, $200,000 against $130,000.

Borg-Warner Corp., Chicago, Ill. First nine months, 1947: net profit, $15,707,583, equal to $6.50 a common share, against $4,152,014 or $1.65 a share, in the corresponding period last year; sales, $205,881,315, against $102,515,346.

Columbian Carbon Co., New York, N. Y., and subsidiaries. Three quarters, 1947: net profit, $4,680,587, equal to $2.90 each on 1,612,218 capital shares, contrasted with $3,747,538, or $2.32 a share, in the first nine months of 1946; sales, $30,560,953, against $24,709,306; reserve for income taxes, $2,250,000, against $1,526,328.

E. I. du Pont de Nemours & Co., Inc., Wilmington Del., and wholly owned subsidiaries. Nine months ended September 30: net profit, $88,220,901, equal to $7.27 each on 11,122,102 common shares, compared with $82,179,876, or $6.88 each on 11,121,962 common shares for the corresponding period in 1946; provision for federal taxes, $50,760,000, against $45,030,000; sales, $582,773,567, against $481,995,910.

Hewitt-Robins, Inc., Buffalo, N. Y. First nine months, 1947: net earnings, $927,027, equal to $3.33 a common share, contrasted with $72,909 in the 1946 period.

Link-Belt Co., Chicago, Ill., and subsidiaries. Nine months to September 30: net profit, $4,809,444, equal to $5.95 each on 807,930 common shares, against $2,193,907, or $2.92 each on 806,930 shares, in the like months last year.

(*Continued on page* 424)

Dividends Declared

Company	Stock	Rate	Payable	Stock of Record.
Belden Mfg. Co.	Com.	$0.30 extra	Jan. 2	Nov. 17
Belden Mfg. Co.	Com.	0.30 q.	Dec. 1	Nov. 17
Brunswick-Balke-Collender Co.	Com.	1.00 yr.-end	Dec. 15	Dec. 1
Brunswick-Balke-Collender Co.	Pfd.	1.25 q.	Jan. 2	Dec. 20
Crown Cork & Seal Co., Inc.	Pfd.	0.50 q.	Dec. 15	Nov. 21
Dewey & Almy Chemical Co.	Com.	0.35 q.	Dec. 15	Nov. 29
E. I. du Pont de Nemours & Co., Inc.	Com.	2.00 yr.-end	Dec. 13	Nov. 24
E. I. du Pont de Nemours & Co., Inc.	$4.50 Pfd.	1.12½ q.	Jan. 24	Jan. 9
E. I. du Pont de Nemours & Co., Inc.	$3.50 Pfd.	0.87½ q.	Jan. 24	Jan. 9
Flintkote Co.	Com.	0.50 yr.-end	Jan. 2	Nov. 24
Flintkote Co.	Com.	0.50 q.	Dec. 10	Nov. 24
Flintkote Co.	Pfd.	1.00 q.	Dec. 15	Nov. 29
General Motors Corp.	Com.	0.75	Dec. 10	Nov. 13
General Motors Corp.	$5.00 Pfd.	1.25 q.	Feb. 2	Jan. 5
General Motors Corp.	$3.75 Pfd.	0.93¾ q.	Feb. 2	Jan. 5
B. F. Goodrich Co.	Com.	1.00 yr.-end	Dec. 31	Dec. 12
B. F. Goodrich Co.	$5.00 Pfd.	1.25 q.	Dec. 31	Dec. 12
Minnesota Mining & Mfg. Co.	Com.	0.50 q. incr.	Dec. 12	Nov. 29
Minnesota Mining & Mfg. Co.	Pfd.	0.47 q. init.	Dec. 12	Nov. 29
Raybestos-Manhattan, Inc.	Com.	1.00 yr.-end	Jan. 2	Dec. 1
Tyer Rubber Co.	Com.	1.00	Nov. 15	Nov. 3
Tyer Rubber Co.	$4.25 Pfd.	1.06¼	Nov. 15	Nov. 3
Union Asbestos & Rubber Co.	Com.	0.50 extra	Jan. 2	Dec. 10
United Elastic Corp.	Com.	0.75	Dec. 10	Nov. 14
United States Rubber Co.	Com.	1.00	Jan. 5	Nov. 21
United States Rubber Co.	Pfd.	2.00 q.	Dec. 8	Nov. 21
Viceroy Mfg. Co.	Com.	0.09 q.	Dec. 15	Dec. 1

Boylastic luggage furnished by Boyle Leather Goods. Photo arrangements courtesy TWA.

–specify Paraplex G-25 and G-40 for plasticizing vinyl compounds

If you are making vinyl compounds where quality is the keynote . . . turn to Resinous Products!

In such applications as vinyl compounds for luggage, PARAPLEX G-25 and G-40 offer outstanding permanence. These resinous plasticizers are non-extractible, non-migratable . . . stable at high temperature . . . impart low temperature flexibility . . . are not affected by long exposure to sunlight and weathering.

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In addition to the PARAPLEX polymeric plasticizers, there's a series of MONOPLEX esters to meet specialized requirements. If you are working with vinyl compounds, we'll be glad to work with you in selecting suitable plasticizers.

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THE RESINOUS PRODUCTS & CHEMICAL COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Patents and Trade Marks

APPLICATION

United States

2,428,051. **Insulating Spacer for Coaxial Cables.** E. R. Touraton, Lyon, France, assignor to International Electric Corp., New York, N. Y.

2,428,097. **Drier Belt Seam Securing Strip Having a Cement-Permeable Thin Open Mesh Fabric Coated on Both Sides with a Solid Water and Heat Resistant Cement Subject to Softening by a Suitable Solvent.** J. Roslund, assignor to Asten-Hill Mfg. Co., both of Philadelphia, Pa.

2,428,214. **In an Electrical Contactor Structure, a Housing or Body of Soft Flexible Material Molded Laterally about a Metallic Receptacle of Substantially Cylindrical Shape** A. H. Gorey, assignor to Graflex, Inc., both of Rochester, N. Y.

2,428,244. **In a Flexible Arch Support Connected with the Insole and Including Arch Plates, a Rubber Cover for the Insole Which Depresses the Plates, Resilient Cushion Fillers between the Cover and the Arch Plates, and a Similar Cushion below the Plates.** D. Roles, Toledo, Oreg.

2,428,262. **Elastic Gored Shoe Upper.** R. A. Bunker, Syracuse, N. Y.

2,428,282. **Fire-Resistant Linoleum Composition Including a Cement Containing Gelled Siccative Oil together with 40 to 70% of Chlorinated Resin.** J. W. Kemmler, Yardley, Pa., assignor to Sloane-Blabom, a corporation of Del.

2,428,293. **Resilient Cushion Supporting a Floating Member in a Vibration Mounting.** C. S. Robinson, assignor of one-half to D. H. Robinson, both of New York, N. Y.

2,428,323. **Electrical Gable End Protector Cap Adapted to Provide a Waterproof Seal for a Cable End Having a Resilient Exposed Face and Rigid Portions.** E. Winer, Baltimore, assignor to National Plastic Products Co., Odenton, both in Md.

2,428,425. **In a Self-Contained Emergency Oxygen Breather, an Expansible Fluid-Tight Container and Apertured Mouthpiece of Rubber or the Like.** I. M. Levitt, Philadelphia, Pa.

2,428,480. **Buoyant Electric Cable Including an Open Helix Enclosed in a Waterproof Covering, Conducting Wires around the Helix, and Rubber Plugs Expanded within the Covering and Having Peripheral Surfaces Molded to and Closely Fitting the Internal Surface of the Covering, so as to Divide the Interior of the Cable into Closed Compartments.** H. A. Tunstall, Gravesend, Kent, assignor to W. T. Henley's Telegraph Works Co., Ltd., Dorking, Surrey, both in England.

2,428,527. **Self-Sealing Gasoline Container Consisting of a Self-Sealing Means and an Inner Liner Including a Polyvinyl Acetal Resin Made with Formaldehyde Plasticized with Diacetin.** D. S. Plumb, North Wilbraham, Mass., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,428,552. **In Wheel Brake Apparatus Including a Circular Support Having a Pair of Spaced Circumferential Walls to Form a Channel, Insulating Blocks in the Channel and a Distensible Member between the Base of the Channel and the Insulating Blocks.** H. J. Butler, Sutton Coldfield, England, assignor to Dunlop Rubber Co., Ltd., London, England.

2,428,591. **In a Pile Surfaced Acoustical Blanket Including a Mat of Fine Glass Fibers Bonded together into a Compressible Integral Body, a Continuous Thin Yieldable Coating of a Resinous Film-Forming Material on One Face of the Mat.** G. Slayter, Newark, O., assignor to Owens-Corning Fiberglas Corp., a corporation of Del.

2,428,626. **Boot with a Lower Section of Rubber and an Upper of Leather.** E. V. Jaeger, Denville, N. J., and R. M. Plympton, assignors to R. C. Nichols Corp., both of Yarmouth, Me.

2,428,654. **Reinforced Plastic Laminate Including Superposed Layers of Glass Fiber Fabric Impregnated and Adhered together with a Resin.** H. W. Collins, Newark, O., assignor to Owens-Corning Fiberglas Corp., a corporation of Del.

2,428,710. **In an Extractor Including a Cylindrical Garment Receiving Receptacle, a Spool Shaped Center Column Member Surrounded by an Expansible Bag Which Is Spool-Shaped When Deflated.** J. P. Jorgenson, Wilmette, and A. G. Kling, assignors to Kling Bros. Engineering Works, both of Chicago, both in Ill.

2,428,731. **Weather Stripping Including an Extruded Channel of Plastic Material.** G. Abrams, Great Neck, N. Y.

2,428,814. **In a Shoe Press Having a Base Member with Span Support, a Pan with a Pneumatic Cushion Positioned in the Base.** D. Russo, assignor to Russite Corp., both of Boston, Mass.

2,428,816. **Rubber-covered Winding Element in a Dynamoelectric Machine.** F. J. Sigmund and W. S. Hlavin, both of Cleveland, O., assignors, by mesne assignments, to Sigmund Corp., a corporation of O.

2,428,880. **In a Pasteurizing Apparatus, Metal Heat Exchanger Plates to Which Are Vulcanized Rubber Gaskets so That When the Plates Are Arranged Side by Side, the Gaskets of the Adjacent Plates Abut Each Other to Form a Space Bounded by the Plates and the Gaskets for the Flow of Liquid.** E. K. Kintner, Millburn, assignor to Arco Welding & Machine Works, Inc., Jersey City, both in N. J.

2,428,932. **Mounted in an Annular Space Formed by Rigid Inner and Outer Members, a Natural Rubber Bushing Which at Each End Falls Short of the Adjacent End of the Space, and in this Space, Radially between Rigid Members and beyond Each End of the Rubber Bushing, a Ring of Resilient, Oil-Resistant Material.** T. L. Fawick, Akron, O.

2,428,936. **In an Aircraft Wing, in Combination, a Protective Covering about the Leading Edge of the Wing to Prevent Ice Accumulation and a Spoiler Structure Including a Flap Element Movable to and from a Drag-Increasing Position.** W. H. Hunter, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,428,950. **In a Vehicle Tongue Mounting Arrangement, an Annular Bushing of Resilient Compressible Material.** D. S. Weiss, Portland, Oreg.

2,428,980. **Gage to Measure Chest Expansion, Including a Strap of Non-Elastic Material with Sections Adjustably Connectable at One End; the Other Ends of the Sections Are Connected by a Strip of Elastic Material.** C. McCann, Roseburg, Oreg.

2,428,995. **In a Feed Throat of a Device for Feeding Granular Material into a Zone of Higher Pressure, a Lining of Resilient Material, and Valve Means Yieldably Sealing the Discharge End of the Feed Throat.** J. B. Rogers, Pasadena, Md.

2,429,019. **Mailbag Protector of Moisture-proof Material.** R. W. Freed, Inglewood, Calif.

2,429,242. **Track for Self-laying Track-Type Vehicles.** C. O. Slemmons, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,429,351. **Golf Club Head with a Compressible Block of Resilient Material Held between Metallic Blocks.** L. R. Fetterolf, Middletown Township, assignor of one-half to F. J. Werner, Jr., Lansdale, both in Pa.

2,429,354. **Plastic Shoe.** N. R. Glass, Philadelphia, Pa.

2,429,426. **Piston Seal.** J. P. Phillips and L. F. Ridder, Jr., both of North Hollywood, Calif., assignors, by mesne assignments, to Bendix Aviation Corp., South Bend, Ind.

2,429,373. **Head Rest for an Operating Chair, Having an Elongated Member of Elastic Material with Each End Thereof Encased in a Metallic Sleeve.** A. J. May and C. G. Maxson, assignors to Ritter Co., Inc., all of Rochester, N. Y.

2,429,486. **A Needled Punched Felt Floor Covering Including an Open Weave Fabric, a Mat of Unwoven Fibers on One Side of the Fabric, and a Backing Layer of Vulcanized Swollen Sponge Rubber at Least Twice as Thick as the Aforementioned Mat.** H. A. Reinhardt, Longmeadow, Mass., assignor to Bigelow-Sanford Carpet Co., Inc., Thompsonville, Conn.

2,429,507. **Trouser Leg Rain Protector.** E. W. Ballenger, Brooklyn, N. Y.

Dominion of Canada

444,262. Ice-Removing Means Including an **Inflatable Structure Having a Rubber Surface Exteriorly Coated with an Extensible and Elastic Film Derived from a Liquid Polymeric Silicone.** B. F. Goodrich Co., New York, N. Y., assignee of E. G. Hass, Akron, O., both in the U.S.A.

444,263. **Ice-Removing Device Including an Expansible Member of Flexible Elastic Material, to the Surface of Which Is Applied an Organo-Silicon Polymer to Reduce Adhesion of Ice.** B. F. Goodrich Co., New York, N. Y., assignee of D. L. Loughborough, Akron, O., U.S.A.

444,270-271. **In a Flexible Coupling Including a Coupler with Torque Receiving and Applying Arms Positioned to Cooperate in Pairs with the Torque Applying and Receiving Arms of a Driving Shaft and a Driven Shaft, Respectively, a Body of Resilient Material Like Rubber, between the Opposed Faces of Each of the Pair of Arms.** Lord Mfg. Co., assignee of L. Wallerstein, Jr., both of Erie, Pa., U.S.A.

444,334. **Ampoule Made of Polythene.** Allen & Hanburys, Ltd., assignee of D. O. Evans, both of London, England.

444,351. **In a Sway Brace for Piping Including a Cylinder Having Opposed Coil Springs Mounted at Each End, a Rubber Connecting Means Arranged to Limit the Extention of the Springs and to Absorb Some of the Energy Released from These Springs after Compression.** General Spring Corp., assignee of J. K. Wood, both of New York, N. Y., U.S.A.

444,395. **Waterproof Section in a Sanitary Garment.** J. G. Frieman, Tiffin, O., U.S.A.

444,398. **In a Valve for Fluids under Pressure, Including a Cylindrical Bore in the Valve Body and a Part Movable Axially along the Bore, an Annular, Cylindrical Sleeve of Deformable, Plastic Material Adhering to the Outer Surface of the Movable Part and to the Inner Surface of a Part Rigid with the Valve Body.** J. L. Gratzmuller, Paris, Seine, France.

444,436. **Self-Locking Device Including a Body of Magnesium Having a Threaded Portion, at One End of Which is a Recess, and in This Recess an Element of Elastic Material Incapable of Resisting Temperatures Ordinarily Required for the Hot-Working of Metal and Having a Surface Located to Be Traversed by and Have a Thread Impressed therein by the Thread of a Cooperating Threaded Member.** Elastic Stop Nut Corp. of America, assignee of V. V. Mason, Scotch Plains, both in N. J., U.S.A.

444,492. **A Rivet Formed of a Non-Metallic Thermoplastic Material Adapted to Develop a Permanent Set.** S. H. Phillips, Los Angeles, Calif., U.S.A.

444,532. **Power Transmission Band.** B. F. Goodrich Co., New York, N. Y., assignee of C. O. Slemmons, Copley, O., both in the U.S.A.

444,601. **Deicing Mechanisms Including an Expansible Member on an Airplane Surface, and Electrical Ice Detector Means.** Bendix Aviation Corp., South Bend, Ind., assignee of W. B. Pond, West Englewood, N. J., both in the U.S.A.

United Kingdom

592,178. **Adhesive Sheeting.** Johnson & Johnson (Great Britain), Ltd.

592,218. **Adhesive Sheets and Tapes.** Johnson & Johnson (Great Britain), Ltd.

592,231. **Adhesives.** Mathieson Alkali Works.

592,253. **Plastic Films as Condenser Dielectrics.** E. Schaefer.

592,286. **Metal-Containing Plastic Molded Articles.** English Metal Powder Co., Ltd., H. Meyersberg, and W. G. Wearmouth.

592,294. **Belting.** Dunlop Rubber Co., Ltd., and W. Lord.

592,325. **Films and Adhesive Coatings.** Imperial Chemical Industries, Ltd., and D. Whittaker.

592,457. **Pneumatic Structure.** Wingfoot Corp.

592,527. **Printers' Blankets.** Feldmuhle, A.G.

592,594. **Liquid Containers and Sealing Means therefor.** Glastics, Ltd., and W. Bennett.

592,722. **Rubber Springs.** G. S. Moulton & Co., Ltd., and A. E. Moulton.

592,755. **Cushion for Conduit and Wire Supporting Clips.** Adel Precision Products Corp.

592,861. **Face Mask.** G. G. Niclas.

592,994. **Fluid Pressure Operated Brakes and the Like.** Dunlop Rubber Co., Ltd., and H. J. Butler.

592,996. **Sealing Ring.** General Tire & Rubber Co.

593,009. **Machinery Packing for Sealing Joints between Movable Parts.** General Tire & Rubber Co.

PROCESS

United States

2,428,127. **Fabric-Reinforced Rubber Girdle.** A. E. Sidneil, Akron, O.

2,428,406. **Dipped Rubber Article with a Roll Edge Containing a Resilient Core.** J. M. Auzin, Warwick, R. I., assignor to Davol Rubber Co., a corporation of R. I.

2,428,407. **Separate Balloon Section for an Inflatable Catheter.** J. M. Auzin, Warwick, R. I., assignor to Davol Rubber Co., a corporation of R. I.

2,428,697. **Casting Thermoplastic Resin.** L. E. Champer, Burbank, Calif., assignor, by mesne assignments, to F. H. Rolapp.

2,428,771. **Making Sheet Material from Inorganic Fibers Mixed with an Aqueous Dispersion of a Heat Curable Binder.** R. Almy Lancaster Township, assignor to Armstrong Cork Co., Lancaster, Both in Pa.

2,429,121. **Shaped Rubber Articles.** C. J. Crowley, assignor to Seamless Rubber Co., both of New Haven, Conn.

2,429,122. **Rubber Gloves and Similar Articles.** C. J. Crowley, assignor to Seamless Rubber Co., both of New Haven, Conn.

2,429,123. **Shaped Hollow Rubber Article.** C. J. Crowley, assignor to Seamless Rubber Co., both of New Haven, Conn.

2,429,177. **Progressively Stretching Laterally a Continuous Sheet of Thermo-Stretchable Material.** F. J. Young, Kent, assignor to Wingfoot Corp., Akron, both in O.

2,429,340. **Rigid, Integral and Non-Lamellar Shape of Molecularly Oriented Polymer.** J. Bailey, West Hartford, assignor to Plax Corp., Hartford, both in Conn.

Dominion of Canada

444,264. **Treating Cord Fabric Preparatory to its Incorporation in a Body of Rubbery Material.** B. F. Goodrich Co., New York, N. Y., assignee of M. W. Wilson, Akron, O., both in the U.S.A.

444,459. **Forming a Container from Laminated Material Including a Layer of Paper and a Layer of Rubber Hydrochloride.** Shellmar Products Corp., assignee of Shellmar Products Co., both of Mount Vernon, O., assignee of G. A. Moore, New York, N. Y., both in the U.S.A.

444,461. **Fire Hose.** Sillick Holding Co., Ltd., Newcastle-upon-Tyne, Northumberland, assignee of M. Balkin, Bentham, Lancashire, both in England.

United Kingdom

592,127. **Extrusion of Polytetrafluoroethylene.** Imperial Chemical Industries, Ltd., and E. J. Macginnis.

592,188. **Articles from Liquid Dispersions of Rubber.** Dewey & Almy Chemical Co.

592,225. **Reinforced Film.** Sylvania Industrial Corp.

592,228. **Coated Fibrous Materials.** Sylvania Industrial Corp.

592,380. **Providing Articles of Thermosetting Plastics with Metallic Decorations.** L. Rado.

592,526. **Securing and Insulating Cable End Terminals.** Titeflex, Inc.

592,542. **Coloring Surfaces of Vinyl Chloride Polymer Compositions.** Imperial Chemical Industries, Ltd.

592,548. **Providing Elastic Thermoplastic Sheets with Decorative Designs.** L. Rado.

592,583. **Molding Plasticized Synthetic-Rubber-Like Materials.** General Electric Co., Ltd., O. W. Humphreys, and N. L. A. Pollard.

592,705. **Hollow Articles, as Collapsible Tubes, from Plastic Materials.** Wheeling Stamping Co.

592,762. **Containers, Hollow Ware, etc. from Resin-Impregnated Laminations.** Sir S. S. Bhatnagar, A. R. Khan, and L. C. Verman.

592,960. **Welding together Sheets of Thermoplastic Materials.** G. Haim and H. P. Zade.

CHEMICAL

2,428,120. **Recovery of Furfural from a Mixture of Furfural and Polymer.** G. H. Miller, Port Arthur, Texas, assignor to Texas Co., New York, N. Y.

2,428,252. **Compound Including Butadiene-Styrene Copolymer, Sulfur, and Anhydrous Amorphous, Finely Divided Silica.** G. von Stroh, Berkeley, assignor to Permanente Metals Corp., Oakland, both in Calif.

2,428,298. **For Use on Vehicular Brakes, a Friction Element Including a Mass of Friction Material, Inert Filler, and a Friction Modifying Agent, Bonded with the Heat-Reaction Product of a Mixture from the Group of a Combination of Crude Natural Rubber and Reclaimed Rubber, and Crude Natural Rubber Cement together with a Heat-Resistant Phenol-Aldehyde Resin, and Sulfur; the Bond also Includes Friction-Stabilizing Particles of a Copolymer of Butadiene 1,3 or 2 Methyl Butadiene 1,3 and Acrylic Acid Nitrile or Methacrylic Acid Nitrile.** R. E. Spokes, Ann Arbor, and E. C. Keller, Detroit, both in Mich., assignors to American Brake Shoe Co., a corporation of Del.

2,428,299. **For Use on Vehicular Brakes, a Friction Element Including Friction Material, Inert Filler, and a Friction-Modifying Agent, Bonded with the Heat-Reaction Product of Heat-Polymerized Linseed Oil, together with a Heat-Resistant Phenol-Aldehyde Resin, and Sulfur; the Bond Includes Friction-Stabilizing Particles of a Copolymer of Butadiene 1,3 or 2 Methyl Butadiene 1,3 and Acrylic Acid Nitrile or Methacrylic Acid Nitrile.** R. E. Spokes, Ann Arbor, and E. C. Keller, Detroit, both in Mich., assignor to American Brake Shoe Co., Wilmington, Del.

2,428,358. **Sticking Film Produced by Combining with Crude Guaiacol, Crude Cresol or Crude Phenol, Formaldehyde, Hexamethylene Tetramine, Ammonia and Tannin.** E. Cornhoff, St. Marcelin, France; vested in the Attorney General of the United States.

2,428,453. **Making Highly Elastic Resilient Filaments, Threads, Yarns and Other Textile Articles from a Water-Insoluble Vinyl Resin.** T. A. Feild, Jr., Charleston, W. Va., assignor to Carbide & Carbon Chemicals Corp., a corporation of N. Y.

2,428,516. **Separating Isobutylene from Admixture with Butene-1.** H. E. Drennan, Bartlesville, Okla., assignor to Phillips Petroleum Co., a corporation of Del.

2,428,559. **Liquid Resinous Composition for Determining the Strain Concentration in a Rigid Article and Capable of Drying by Evaporation to Form a Brittle Film. This Composition Includes a Solution in 1,2 (cis) Dichloroethylene of a Calcium Resinate with Normal Butyl Stearate as Plasticizer.** G. Ellis, assignor to Magnaflux Corp., both of Chicago, Ill.

2,428,608. **For Filling a Cavity in a Shielded Spark Plug Terminal Construction, a Dielectric Composition Including a Major Proportion of a Liquid Polymer of a Organo-Silicone and a Minor Proportion of an Inorganic Aerogel.** S. L. Bass, assignor to Dow Chemical Co., both of Midland, Mich.

2,428,624. **Method of Dehydrogenating Butene-2 whereby a Product Containing Butadiene Is Recovered.** C. H. Holder, Cranford, N. J., assignor to Standard Oil Development Co., a corporation of Del.

2,428,668. **Sulfuric Acid Absorption of Isobutylene.** H. J. Hibshman, Plainfield, and I. P. Jones, Basking Ridge, both in N. J., assignors to Standard Oil Development Co., a corporation of Del.

2,428,716. **Coated Fabrics Prepared by Applying a Composition Including an Aqueous Emulsion of Polyvinyl Chloride and a Plasticizing Agent, Removing the Water, and Then Applying a Composition Containing Polyvinyl Chloride and a Plasticizer and Heating until Gelatinization is Effected.** J. H. McGill, Manchester, and L. B. Morgan, Baguley, both in England, assignors to Imperial Chemical Industries, Ltd., a corporation of Great Britain.

2,428,752. **Producing a Clear Water-Soluble Stable Resin by Heat Reacting Urea and Aqueous Formaldehyde.** P. S. Hewett, Royal Oak, assignor to Reichhold Chemicals, Inc., Detroit, both in Mich.

2,428,787. **Polymerization Product of a Polymerizable Unsaturated Alkyd Resin and a Polyallyl Ester of a Saturated Aliphatic Polycarboxylic Acid.** G. F. D'Alelio, Pittsfield, Mass., assignor to General Electric Co., a corporation of N. Y.

2,428,788. **Resinous Composition Produced by Polymerization of a Mixture Including an Itaconic Diester of an Unsaturated Monohydric Alcohol and a Polymerizable Esterification Product of a Polyhydric Alcohol, an Alpha Unsaturated Alpha-Beta-Polycarboxylic Acid and a Polycarboxylic Acid from the Class of Saturated Aliphatic Polycarboxylic Acids and Aromatic Polycarboxylic Acids.** G. F. D'Alelio, Pittsfield, Mass., assignor to General Electric Co., a corporation of N. Y.

2,428,907. **Copolymers of a Diene and an Alpha-Substituted Beta-Halo Acrylonitrile.** A. M. Clifford, Stow, and J. G. Lichty, Cuyahoga Falls, assignors to Wingfoot Corp., Akron, all in O.

2,429,018. **Preparing Polymerized Material by Converting Part of a Material from the Group of Acrylonitrile, Alpha Alkyl Acrylonitriles and Alpha-Halo Acrylonitriles to an Acrylate by Heating with Sulfuric Acid, Water, and a Monohydric Saturated Primary Aliphatic Alcohol, and Continuing the Heating until the Acrylate and the Unconverted Material Have Copolymerized.** J. D. D'Ianni, assignor to Wingfoot Corp., both of Akron, O.

2,429,031. **In Preparing a Dihalonitrile by Reacting an Alpha Beta-Unsaturated Nitrile and a Halogen, the Step of Initiating the Reaction in the Presence of an Anhydrous Hydrogen Halide.** J. D. Robinson, Cuyahoga Falls, assignor to Wingfoot Corp., Akron, both in O.

2,429,060. **For Impregnating Fibrous Sheets Designed to Form Articles Having, in Part, Non-Horizontal Areas, a Polymerizable Low-Pressure Impregnating Resinous Material, Which Is a Mix Including a Liquid Dihydric Alcohol Ester of an Ethylene Alpha-Beta-Dicarboxylic Acid, a Liquid Monomeric Ethylenic Compound, a Peroxy Polymerization Catalyst, and a Hydrazine Compound.** W. R. Hoover and R. M. Paulsen, Mishawaka, and S. V. Landgraf, Elkhart, both in Ind., assignors to United States Rubber Co., New York, N. Y.

2,429,080. **Reducing the Rate of Cure of a Copolymer of Butadiene-1,3 and Styrene with an Oxidizing Agent and Tetrachlor p-Benzoquinone, by Adding to the Stock before Cure a Thiuramdisulfide.** R. R. Sterrett, Naugatuck, Conn., assignor to United States Rubber Co., New York, N. Y.

2,429,102. **New Resinous Products Adapted for Use as Mold Lubricants and the Like, Consisting of Monobasic Aliphatic Caboxylic Acid Esters of Lignin Material Formed by Reduction of the pH of the Black Liquor of a Soda Cook of Woody Matter to between 7.8 and 9.** H. F. Lewis and F. E. Brauns, both of Appleton, Wis., assignors, by mesne assignments, to Mead Corp., Chillicothe, O.

2,429,126. **Separation of Acetylenes and Butadiene from an Ammonical Cuprous Salt Solution Containing Them.** R. A. Given, Lake Charles, La., assignor to Standard Oil Development Co., a corporation of Del.

2,429,134. **Improvements in the Separation and Concentration of Olefins from Hydrocarbon Mixtures.** C. E. Morrell, Westfield, and M. W. Swaney, Cranford, both in N. J., assignors to Jasco, Inc., a corporation of La.

2,429,155. **Polymeric Vinylidene Chloride Product Stabilized with 2,2'-Dihydroxy-Benzophenone and a Xenyl Salicylate.** R. F. Boyer, assignor to Dow Chemical Co., both of Midland, Mich.

2,429,165. **Polymeric Vinylidene Chloride Product Stabilized with an Alkyl Ester of an Acyl Citric Acid Wherein the Alkyl Groups Contain One to 6 Carbon Atoms and the Acyl Group Contains from 2 to 4 Carbon Atoms.** L. A. Matheson and R. F. Boyer, assignors to Dow Chemical Co., all of Midland, Mich.

2,429,219. **Linear Superpolyesters.** J. C. Cowan, Peoria, Ill., and D. H. Wheeler, Minneapolis, Minn., assignors to the United States of America, as represented by the Secretary of Agriculture.

2,429,223. **Adhesive Tape Including a Backing and a Mass Including the Dehydrated Residue of a Combined Aqueous Dispersion of Latex, a Normally Solid Resin from the Group of Rosin, Hydrogenated Rosin and Hydrogenated Glycerol Abietate, Hydrogenated Methyl Abietate, and a Water-Absorptive Adhesive.** W. Eustis, Newton, Mass., and G. R. Orrill, Western Springs, Ill., assignors to Kendall Co., Boston, Mass.

2,429,329. **Partially Polymerized, Thermosetting Molding Powder Stable When Stored for Long Periods of Time and Including Steam-Disintegrated Redwood Pulp Still Retaining Non-Volatile Ingredients of the Original Redwood; Furfuryl Alcohol-Formaldehyde Resin; Boric Acid; Lignin Stearate Mold Lubricant; Paraformaldehyde and Carbon Black.** E. Reineck and I. R. Dunlap, assignors to Institute of Paper Chemistry, all of Appleton, Wis.

2,429,369. **Heat-Reactive Adhesive Bonding Medium for Hot Pressing Work Including an Impregnated Film Carrier Containing the Dry Unset Resin Compound Formed from a Solution of a Dihydroxy Benzene-Aldehyde Condensation Product and Hexamethylenetetramine.** P. H. Rhodes, Portland, Me., assignor, by mesne assignments, to Koppers Co., Inc., a corporation of Del.

2,429,397. **Treating Rayon Cord before Incorporation in Rubber with an Aqueous Dispersion Including Ammonia and a Mixture of an Aqueous Solution of a Resin Obtained by the Partial Condensation of a Polyhydric Phenol and an Aldehyde, and a Synthetic Latex Prepared by the Emulsion Copolymerization of Butadiene-1,3, and Styrene.** J. Compton, Cuyahoga Falls, and M. W. Wilson, Akron, both in O., assignors to B. F. Goodrich Co., New York, N. Y.

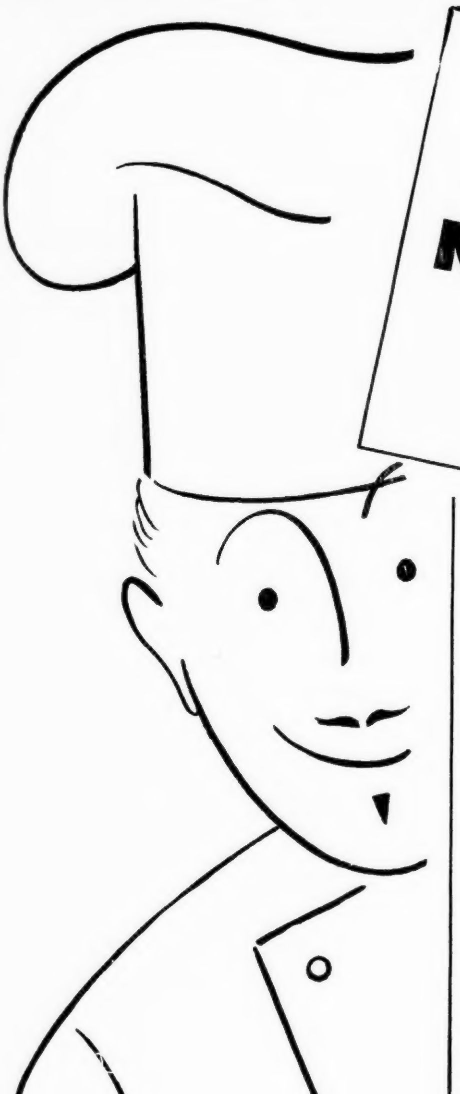
2,429,411. **1-Alkoxy-2,4-Pentadienes and Substituted Derivatives thereof.** E. R. H. Jones, London, and J. T. McCombie, Manchester, both in England, assignors to Imperial Chemical Industries, Ltd., a corporation of Great Britain.

2,429,49. **A Butadiene-1,3-Styrene Copolymer Synthetic Rubber Reinforced with Calcium Silicate.** J. C. Westfahl, D. S. Sears, and J. W. Martindale, Cuyahoga Falls, O., assignors to B. F. Goodrich Co., New York, N. Y.

2,429,459. **Subjecting Succinonitrile Vapor to Pyrolysis as a Temperature of 300 to 700° C. in the Presence Solely of Inert Material to Produce Vinyl Cyanide.** C. R. Harris, Lockport, N. Y., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,429,460. **Production of Vinyl Cyanide by Reacting Acetylene with Hydrocyanic Acid at a Temperature of 450 to 550° C. in the Presence of an Alkali Metal or Alkaline Earth Metal Cyanide and Condensing the Vinyl Cyanide Vapors in the Presence of Acidic Material to Inhibit Loss of Vinyl Cyanide by Decomposition and Secondary Reactions.** C. R. Harris, Lockport, and W. C. Sharples, Niagara Falls, both in N. Y., assignors to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,429,554. **Halogenated Cross Linked Aromatic Amine Polymer.** S. S. Kistler, West Boylston, assignor to Norton Co., Worcester, both in Mass.



RECIPE

(Test No. 7447 from the Barrett Rubber Research Laboratory)

FOR

NATURAL RUBBER COMPOUND

With a Shore A Hardness of 65 for Molded and Extruded Goods

This recipe uses the advantages of CUMAR* resin to produce a mineral-filled natural rubber compound of low cost and good physical properties for molded and extruded goods. The compound has relatively low viscosity, resulting in excellent processing; is free from scorch tendencies and is readily extruded; and although highly loaded, produces a rubbery and snappy vulcanizate with good aging characteristics.

Tension and Hardness Data:
Press Cure: 10 Minutes at 316°F (70 lb.)

	Unaged	Aged 14 Days at 70° C
Tensile—P.S.I.	1350	1400
Elongation—%	460	430
Hardness—Shore A	65	72

RECIPE	WEIGHT BASIS
Smoked Sheets	100.00
"CUMAR" Resin, MH 2½ Grade	15.00
Clay (Hard)	100.00
Calcium Carbonate (Precipitated)	100.00
Zinc Oxide	5.00
Stearic Acid	2.00
SUNPROOF	2.00
AMINOX	0.25
Red Oxide	4.00
Sulfur	3.00
ZENITE B	1.50
TOTAL	**332.75**

Mooney Viscosity (Large Rotor) 4 minutes at 212°F	30
Specific Gravity	1.61
Rubber Hydrocarbon, % by Wt.	30.1
Rubber Hydrocarbon, % by Vol.	52.5
Cost Per Pound	$0.08 (Approx.)

Mooney Scorch Test Data at 250°F (Small Rotor):

Minutes	Viscosity
1	16
10	16
20	18

*

THE BARRETT DIVISION

ALLIED CHEMICAL & DYE CORPORATION

40 Rector Street, New York 6, N. Y.

In Canada: The Barrett Company, Ltd., 5551 St. Hubert St., Montreal, P. Q.

*Reg. U. S. Pat. Off.

2,429,565. **Reaction Products of Hexamethylenetetramine and Petroleum Wax Substituted Oxyaromatic Compounds Having Rubber-Like Properties.** O. M. Reiff, Woodbury, N. J., assignor to Socony-Vacuum Oil Co., Inc., a corporation of N. Y.

2,429,582. **Producing Polymers by Heating a Dimethylsulfolene in the Presence of a Member of the Group Consisting of Molecular Oxygen and Peroxides at between 80 and 200° C.** R. C. Morris and J. L. Van Winkle, both of Berkeley, assignors to Shell Development Co., San Francisco, both of Calif.

2,429,587. **Rubbery, Extensible Vulcanization Product of a Mixture of a Rubbery Extensible Vinyl Alkyl Ether Polymer, Sulfur, and a Diacyl Peroxide.** C. E. Schildknecht, Easton, Pa., assignor to General Aniline & Film Corp., New York, N. Y.

Dominion of Canada

444,273. **Thermoplastic Composition from the Class of Polystyrene Resins, Methyl Methacrylate Resins, and Cellulose Esters Plasticized with a Mixture of Allyl Halophthalates.** Mathieson Alkali Works, New York, assignee of C. C. Clark, Kenmore, both in N. Y., U.S.A.

444,340. **Resinous Composition Including the Product Obtained by Heat-Resinifying Furfuryl Alcohol in the Presence of a Catalyst Source Material Consisting of a Monomeric Organic Compound Containing a Heat-Releasable Hydrohalide-Forming Halogen in an Aliphatic Radical of the Compound.** Canadian General Electric Co., Ltd., Toronto, Ont., assignee of B. W. Nordlander, Schenectady, N. Y., U.S.A.

444,363. **A Normally Flexible Plasticized Polyvinyl Alcohol Composition Containing, as a Thermostabilizing Agent, a Substance from the Group of the Chlorides of Aluminum and Tin.** Resistoflex Corp., Belleville, assignee of C. Dangelmajer, Nutley, both in N. J., U.S.A.

444,364. **Normally Flexible Plasticized Polyvinyl Alcohol Composition Containing, as a Thermostabilizing Agent, a Substance from the Group of the Sulfates of Copper and Iron.** Resistoflex Corp., Belleville, assignee of C. Dangelmajer, Nutley, both in N. J., U.S.A.

444,365. **Stabilizing Butadiene-1,3 Latices by Means of a Di-(Tertiary-Alkyl) Phenol.** Standard Oil Development Co., Linden, assignee of M. W. Swaney, Cranford, and F. W. Banes, Roselle, all in N. J., U.S.A.

444,376. **Composition Containing a Polyvinyl Acetal Formed from Polyvinyl Alcohol and an Aliphatic Aldehyde Which Contains N,N'-Dicyclohexyl Ethylene Diamine as a Stabilizer.** Wingfoot Corp., Akron, assignee of F. W. Cox, Cuyahoga Falls, both in O., U.S.A.

444,377. **Rubber Vulcanized in the Presence of 1-cp-Hydroxyphenylamino-Methylene)-Beta-Naphthol.** Wingfoot Corp., assignee of A. F. Hardman, both of Akron O., **U.S.A.**

444,417. **Finishing Textiles with a Formaldehyde Condensation Product of a N-Substituted Guanamine.** American Cyanamid Co., New York, N. Y., assignee of J. T. Thurston, Cos Cob, Conn., U.S.A.

444,418. **Rendering Net Fabrics Resistant to Distortion by Laundering by Impregnation with an Emulsion in Which the Disperse Phase Contains a Blend of a Phthalic Anhydride-Polyhydric Alcohol Resin with a Member of the Group of Water-Insoluble Organic Solvent-Soluble Alkylated Melamine-Formladehyde and Urea-Formaldehyde Resins, and the Continuous Phase Is an Aqueous Solution of a Water-Soluble Methylated Methylol Melamine Resin.** American Cyanamid Co., New York, N. Y., assignee of R. M. Fischer, Paterson, N. J., U.S.A.

444,434. **Plasticized Thermosplastic Composition Having a High Degree of Flexibility and Resistance to Impact at Temperatures as Low as —40 C. and Including Ethyl Cellulose and an Alkyl Ester of an Acid from the Class of Hydroxy- and Acyloxystearic Acids.** Dow Chemical Co., assignee of M. J. Hunter and E. L. Kropscott, all of Midland, Mich., U.S.A.

444,441. **Shaped or Molded Mass of Colloided Thermoplastic Cellulose Acetate Composition.** Hercules Powder Co., Wilmington, Del., assignee of W. E. Gloor, New Brunswick, N. J., both in the U.S.A.

444,502. **Composition Including a Polymerizable, Acid-Curing Thermosetting Resin and Endomethylene Tetrahydrophthalic Anhydride.** American Cyanamid Co., New York, N. Y., assignee of W. Hull, Noroton Heights, Conn., U.S.A.

444,520. **Dialkyl Cyclobutane.** Dominion Rubber Co., Ltd., Montreal, P.Q., assignee of P. T. Paul, Naugatuck, Conn., U.S.A.

444,521. **Thiazyl Sulfur Halides.** Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of W. H. Ebelke, Naugatuck, Conn., U.S.A.

444,522. **Pyrimidine Derivatives from the Class of the Sulfuric Acid Conversion Products of an Alkyl-Substituted 2-Mercapto Dihydropyrimidine and Their Salts.** Dominion Rubber Co., Ltd., Montreal, P.Q., assignee of **C. H. Stiteler, Naugatuck, Conn., U.S.A.**

444,523. **Compound of the Formula R—O—X, Where R Is an Arylene-Thiazyl Sulfide Group, O Is Oxygen, and X Represents an Alkyl, Aryl, or an R Group.** Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of W. E. Messer, Cheshire, Conn., U.S.A.

United Kingdom

592,157. **Luminescent Compounds.** British Thomson-Houston Co., Ltd., and R. S. Wells.

592,167. **Rosin Base Resins.** E. P. Newton (Hercules Powder Co.).

592,254. **Acetalized and Ketalized Copolymers.** British Thomson-Houston Co., Ltd.

592,278-279. **Crystalline Hydroxy-Hydroxy-Diphenyl-Methanes.** Bakelite, Ltd. (Bakelite Corp.).

592,301. **Plasticizing—Natural or Synthetic Rubber-like Compositions.** American Cyanamid Co.

592,306. **Low-Temperature Olefinic Polymerization Processes.** J. C. Arnold (Standard Oil Development Co.).

592,335. **Polymerization Products of Ethylene.** Imperial Chemical Industries, Ltd.

592,400. **Synthetic Resins.** British Thomson-Houston Co., Ltd.

592,409. **Insulating Materials.** Standard Telephones & Cables, Ltd.

592,421. **Malonic Acid Esters and Their Polymers.** Wingfoot Corp.

592,456. **Dimethyl Silicone Products.** British Thomson-Houston Co., Ltd.

592,486. **Polymerization and Interpolymerization of Ethylene.** Imperial Chemical Industries, Ltd.

592,487. **Ethylene Polymerization Processes.** E. I. du Pont de Nemours & Co., Inc.

592,494. **Catalytic Conversion of Hydrocarbons.** J. C. Arnold (Standard Oil Development Co.).

592,517. **Solid Polymers and Interpolymers of Ethylene.** E. I. du Pont de Nemours & Co., Inc.

592,552. **Methyl Silicone Synthetic Resins.** British Thomson-Houston Co., Ltd.

592,604. **Copolymers of Unsaturated Esters of Ethereal Oxygen-Containing Acids.** Shell Development Co.

502,719. **Mass Polymerization of Resins.** United States Rubber Co.

592,747. **Furyl and Difuryl Sulfonates.** American Cyanamid Co.

592,838. **Unsaturated Esters.** Standard Oil Development Co.

592,852. **Adhesive Compositions.** Johnson & Johnson (Great Britain), Ltd.

592,867. **Styrenes and Other Products.** Dominion Tar & Chemical Co., ltd.

592,913. **Emulsion Polymerization of Butadienes.** General Aniline & Film Corp.

MACHINERY

United States

2,428,275. **Apparatus to Mold Articles.** A. C. Frankwich and S. M. Martin, Baltimore, Md., assignors to Western Electric Co., Inc., New York, N. Y.

2,428,315. **Injection Molding Machine Spreader.** N. Lester, Cleveland Heights, assignor to Lester Engineering Co., Cleveland, both in O.

2,428,411. **Bearing Structure for Journaling a Shaft Normally Rotating with at least a Portion thereof in Contact with Liquids Sensitive to Coagulation.** H. L. Davis, Walpole Mass., assignor to B. F. Goodrich, Co., New York, N. Y.

2,428,430. **Device to Trim Excess Rubber from an Endwise Traveling Strip of Fabric Coated with Rubber.** N. Mong, assignor to General Tire & Rubber Co., both of Akron, O.

2,428,664. **Apparatus to Molding Soles.** J. Gregg, assignor to L. D. Gregg, both of Newhope, Pa.

2,428,732. **Tire Drier.** K. E. Adams, Shelbyville, Tenn.

2,428,851. **Apparatus to Extrude Vulcanizable Insulating Compound on a Continuously Moving Electrical Conductor.** R. A. Montamat, Scotch Plains, N. J., assignor to General Cable Corp., New York, N. Y.

2,428,944. **Apparatus for Vulcanizing Hollow Rubber Articles under Internal and External Fluid Pressures.** H. P. Schrank, Monroe Falls, assignor to Seiberling Rubber Co., Barberton, both in O.

United Kingdom

592,558. **Tire Spreaders.** A. J. Penny.

592,587-588. **Apparatus for Dialyzing Solutions.** Sylvania Industrial Corp.

592,807. **Plastic Molding Machines.** A. A. Burry.

592,834. **Molding or Extrusion Machines.** Rose, Downs & Thompson Ltd., and F. J. C. Hindson.

UNCLASSIFIED

United States

2,428,143. **Flexible Coupling for Tubes.** J. J. Chavayda, assignor to Parker Appliance Co., both of Cleveland, O.

2,428,189. **Coupling for Rubber-Lined Hose.** J. N. Wolfram, assignor to Parker Appliance Co., both of Cleveland, O.

2,428,469. **Protective Device for a Wheel Provided with a Pneumatic Tire.** I. R. Plant, North Bergen, and E. F. Miltenberger, Red Bank, both in N. J., assignors of one-fourth to W. A. Van Sielen, Bayside, N. Y., and one-fourth to E. A. Schlichting, West Caldwell, N. J.

2,428,478. **Anti-Friction Compound for Use between Inner Tube and Casing of a Vehicle Tire.** B. P. Thurber, Sr., Denver, Colo.

2,429,024. **Tire Pressure Indicator.** E. C. Jones, assignor to Institute of Industrial Research, both of San Antonio, Tex.

2,429,032. **Method of Balancing Pneumatic Tires.** D. E. Sheahan, assignor to Wingfoot Corp., both of Akron, O.

2,429,061. **Counter-Rotating Propeller Assembly.** W. H. Hunter, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,429,095-099. **Fungicidal Compositions.** E. C. Ladd, Passaic, N. J., assignor to United States Rubber Co., New York, N. Y.

United Kingdom

592,211. **Hose Clamp.** J. T. King.

592,361. **Pipe Couplings.** P. E. Thomas.

592,381. **Devices to Limit Bending and Prevent Kinking of Electric Cables, Hose, etc.** J. Bell and C. S. Wright.

592,454. **Band or Hose Clips.** W. E. O'Shei.

592,773. **Removing Dust from Abrading, Polishing, and Like Machines.** Phillips Rubber Soles, Ltd., and G. F. Eyles.

TRADE MARKS

United States

433,161. **Insulam.** Electrical insulating materials. New Insulation Co., Ltd., Gloucester, England.

433,201. Representation of tenpins and a microphone and the word: **"Tenpin Tattler."** Bowling balls. S. Weinstein, doing business as Universal Bowling & Billiard Supply, Chicago, Ill.

433,221. **Deenax.** Antioxidant. Standard Oil Co. of N. J., Wilmington, Del.

433,286. Representation of an American eagle contained in an oval with the words: **"American Eagle."** Sporting goods including baseballs, softballs, basketballs, footballs, shoulder pads, volleyballs, etc. Spiegel, Inc., Chicago, Ill.

433,288. **Foamex.** Cushions, padding, and packaging. Firestone Tire & Rubber Co., doing business as Firestone Rubber & Latex Products Co. and Firestone Industrial Products Co., Akron, O.

433,291. **Mistlon.** Plastic packaging sheet materials. Minnesota Mining & Mfg. Co., St. Paul, Minn.

433,297. **Vanguard.** Plastic cushions, mattresses, etc. Vanguard Corp., Springfield, Mass.

433,298. Representation of a toy soldier seated beneath a signpost containing the words: **"Tiny Town."** Crib mattresses, pads, etc. National Mattress Co., Huntington, W. Va.

433,305. Representation of an automobile floor mat. Automobile mats. Anchor Rubber Products, Inc., Cleveland, O.

433,315. **Lance.** Rubber bands. A. Meyers & Sons Corp., New York, N. Y.

433,316. **Atomic Dots.** Pressure-sensitive adhesive-coated luminous disks. Radium Industries, Inc., Chicago, Ill.

433,327. **Astralite.** Fountain pens and parts. L. E. Waterman Co., New York, N. Y.

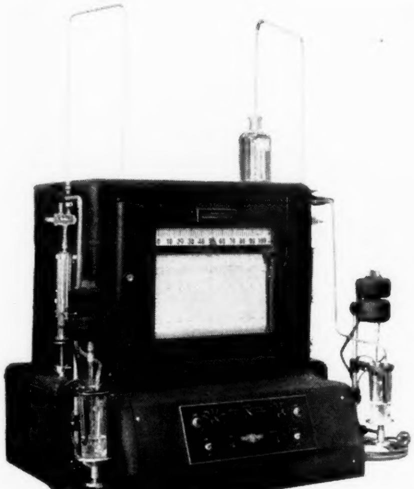
433,345. **Hydro Chiffon.** Raincoats, aprons, etc. Hydro-Tex Corp., Chicago, Ill.

433,353. **Chique.** Girdles and foundation garments. Chique Creations, New York.

433,354. Representation of a shoemaker and the words: **"Slippercraft Hand Lasted."** Footwear. J. Goldstein & Sons Co., Boston, Mass.

(*Continued on page 426*)

New Machines and Appliances



"Precision"-Dow Dual Recordomatic Titrator

Dual Automatic Recording Device

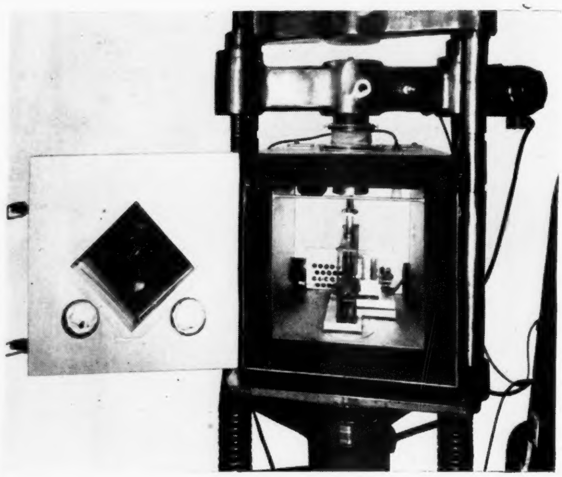
THE "Precision"-Dow Dual Recordomatic Titrator, the first dual automatic recording device designed for plotting titration curves, has been announced by Precision Scientific Co., 3737 W. Cortland St., Chicago 47, Ill. The new unit provides a complete and permanent record of titration curves that are easily reproducible and superior to curves obtained manually. The device, it is claimed, eliminates all work on the part of the operator, except that of preparing solutions and loading the feed unit. Because the unit includes two complete titration set-ups, one sample can be titrated while the second sample is being prepared for analysis.

The titrator is recommended for routine control and experimental research work of all types. It is equally well suited for aqueous and non-aqueous media and can be used with silver, antimony, platinum, calomel, or glass electrodes. The instrument consists of two parts: a reagent-feeding device and a recording potentiometer. The feeding device comprises two titration set-ups with solenoid-operated shifting to permit selection of either system for titration. The potentiometer is a modified Brown Electronik type. The titrator is completely line-operated except for a dry cell in the potentiometer circuit. Power consumption is only 200 watts, and the instrument is suitable for continuous duty.

Controlled Temperature Cabinet

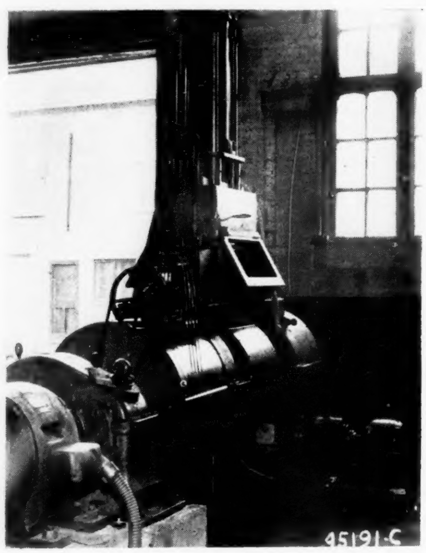
FOR determining the physical properties of plastics in tension, compression, or flexure over the temperature range of —70° to 170° F., Baldwin Locomotive Works, Philadelphia 42, Pa., has developed a new temperature-controlled cabinet for use on standard Baldwin-Tate-Emery testing machines of 60,000 and 120,000 pound capacities. The cabinet's working chamber is approximately 19 inches wide, 18 inches high, and 20 inches deep, and accommodates Templin-type specimen grips of 5,000-pound capacity, a sub-press for compression testing, flexure tool, standard strain followers for either Templin or Microformer recorders, and associated equipment. Standard two-inch gage length tension test specimens, compression specimens two by one-half inch square, or flexure test specimens up to 16 inches in span and two inches square can be tested in the chamber. The chamber permits a deformation of two inches in the tension and flexure specimens.

Behind the working chamber is a servo unit consisting of a



Baldwin Temperature-Controlled Cabinet, with Door Opened, Shown Mounted for a Flexural Test

dry ice container, a mixing chamber, a fan for air circulation, heater coils, and electric temperature control equipment. The cabinet, which has overall dimensions of 27 by 27 by 40 inches, is constructed of polished stainless steel with four inches of thermal insulation. A hinged door and removable top in two sections give access to the cabinet's interior. Tests can be observed through a double plate-glass window in the door, and two hand holes with insulated sleeves permit manipulation of apparatus in the chamber during tests without opening the door.



Improved Mixing Machine

THE Northmaster intensive mixer, designed for mixing all types of heavy and tenacious materials, has been developed by Struthers Wells Corp., Titusville, Pa. Available in working capacities of from one pint to 275 gallons, the mixers have been used successfully for processing natural and synthetic rubber, asphalt compositions, reclaimed rubber, linoleum, floor tile compositions, paints, a wide range of plastic products, and many other hard to handle materials.

The mixer is equipped with heating or cooling jackets for ram, trough, and blades. Completely modern in design, the machine has anti-friction bearings with integral gear unit attached to the trough and rotating with it. In addition, new metal-to-metal seals guard against leakage. The mixing chamber is both liquid- and dust-tight and rotates through a 180-degree angle to permit easy dumping and cleaning.

New Goods and Specialties

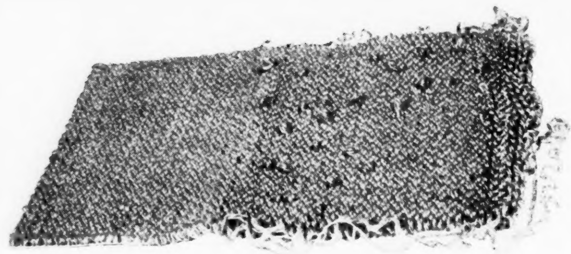
Children's Mittens

WATERPROOF snow mittens to keep children's hands warm and dry are being introduced this winter by United States Rubber Co., Rockefeller Center, New York 20, N. Y. Distributed under the name of U. S. Snow Mitt, the new mittens have a flannel lining and an outside covering of red rubber. They are being made in three sizes: small, medium, and large. In tests conducted last winter in Rhode Island the mittens were found to keep children's hands both dry and warm, solving a problem that has always been a source of worry to mothers. In addition the mittens were said to give a financial saving because they do the work of two or three pairs of regular mittens that have to be dried out frequently.

U. S. Rubber's Snow Mitts for Children

Gasket for School Buses

A NEW type of rot-proof gasket material designed to remain pliable and resilient under cold weather conditions and long service use, is being installed on the vertical and windshield edges of folding doors of school buses built by the Perley A. Thomas Car Works. The material, rubber coated Fiberglas cloth, replaces a rubber-coated organic fabric formerly used on vertical door edges, and a molded rubber material used on windshield edges. The gasket material is made by St. Clair Rubber Co,. using Fiberglas manufactured by Owens-Corning Fiberglas Corp. The pliability and resilience of the new gasket is not appreciably affected by temperature conditions, thus providing a weathertight closure at all times, whereas the rubber coated organic gasket became too stiff in cold weather to give a tight closure. Installed in windshield edges, the Fiberglas-rubber gasket is able to stand up under the jarring caused by opening and closing the bus doors that in time broke down the molded rubber gasket.



Coated with Griptex, Left Half of Rug Shows No Fraying or Unraveling

Rug Backing Compound

GRIPTEX, a rubber-plastic liquid which makes rugs not only skid-proof but also fray-proof and sprout-proof, is now being introduced to housewives. Made by Adhesive Products Corp., 1660 Boone Ave., New York 60, N. Y., the product has until now been available only to rug manufacturers. The material has been designed to reduce accidents caused by slipping and sliding rugs. It makes rugs skid proof even on highly polished floors and dries completely tack-free, it is claimed. It remains permanently flexible and will not mar finely polished floors or harm the rugs to which it is applied.

Application of Griptex is made by brush to the back of a rug. It forms a tough, flexible film which anchors each individual tuft and prevents fraying and unraveling. It also prevent rugs from buckling in the center and curling at the edges. The material gives rugs additional body and firmness and improves their resiliency. The decision to package the product in quart cans for the consumer came after splendid results were reported by rug manufacturers who have already coated more than 2,000,000 square yards of scatter rugs and carpets with Griptex. The material can be applied to all rugs, ranging from small cotton tufted types to axminster, handhooked, and broadloom rugs.

Neoprene Fishing Lures

FISHERMEN can now get life-like lures made of neoprene. Combining extreme realism and durability, the lures have proved that they do catch fish. Artificial lures made of rubber or rubber-like materials have been on the market for a number of years. Some have been good, but others have deteriorated quickly. The new lures made of Du Pont neoprene resist the principal enemies of natural rubber: sunlight, and aging, according to their manufacturer.

All of the new lures have flexible, hollow bodies which make them easier to handle, but this does not interfere when the fish strikes. The coal-black crickets, made in two sizes, are suf-

(*Continued on page 413*)

Life-Like Fishing Lures Made of Neoprene Shown in Standard Plastic Fly-Box, Including Two Crickets, Three Grasshoppers, and a Nymph of the Stone Fly

LATIN AMERICA

BRAZIL

Outlook for Rubber Industry

With the termination of the United States agreements which stabilized rubber prices in Brazil, it became necessary to protect the local industry which is handicapped in the international markets by its high cost of production; so the Parliamentary Commission for the Valorization of Amazonia proposed maintenance of present rubber prices to 1950. On September 9, 1947, the President signed a congressional law by which control over Brazilian rubber production is to be continued until the end of 1950; the law provides for the maintenance of the Washington Agreement price levels for *Hevea* rubber, except *Sernambi Rama*, to December 31, 1950, and for all other grades to December 31, 1947. *Hevea* rubber (except *Sernambi Rama*) not consumed locally is to be bought up with Federal Government credit. Rubber purchases and sales will be handled by the Rubber Credit Bank as heretofore.

In presenting the case for rubber before the Chamber of Deputies, one of the deputies for the State of Amazonas pointed to the importance of rubber for national security. He quoted as example to be followed the attitude of Argentina, which, determined never again to be exposed to the risks of the severe disruption of transportation suffered during the war for lack of rubber, was now subsidizing the development of home-grown rubber, especially guayule; already, he said, millions of young plants had been established on experiment stations, and an experimental laboratory as well as a pilot-plant for the extraction and preparation of guayule and *cryptostegia* rubber had been set up.

The rubber from the Amazon area, he emphasized, provided exports bringing in more than half a billion cruzeiros, thus contributing considerably to the purchasing power of the population. Not less important for the nation was the young and prospering rubber manufacturing industry including 138 factories distributed over the states of Sao Paulo, Rio de Janeiro, Rio Grande do Sul, Amazonas, Para, and the Federal District, with output representing a value not much less than one billion cruzeiros. He added that Brazil was in the unique position of being able to produce rubber and of converting it into all the rubber goods she might need.

Brazilian outputs of rubber, he continued, were about 28,000 tons a year; in 1946 more than 18,000 tons had been used by the local rubber manufacturing industry, and it was expected that 1947 consumption would reach about 22,000 tons, leaving a surplus of between five and six thousand tons. Of this about 3,000 tons must have been taken by America to the end of the term of the Washington Agreement, leaving a net surplus of less than 3,000 tons. The indications were that before long Brazilian production and consumption of raw rubber would be balanced; all the large tire factories in the republic (there are now five large tire factories; a sixth is under construction in Sao Paulo and is expected to be ready to start operating in 1948) were understood to be planning to increase their outputs, and a total of 900,000 automobile tires and 700,000 inner tubes in 1948 could thus be looked for. Motorization, he went on to say, was developing apace in the country, and without being over optimistic, he would put the number of motor vehicles likely to be on the roads in Brazil five years hence at over 500,000, or double the present number. Besides he saw these half-million vehicles running on tires made in Brazil from Brazilian rubber.

Import Licenses for Tires and Tubes

Under the new law to aid rubber, natural and synthetic rubber and all rubber manufactures including tires and tubes which form integral parts of vehicles and machinery are subject to import licenses. The recently created Executive Commission for Rubber Defense will control imports.

The license requirement will no doubt be viewed with satisfaction by local manufacturers who had expressed alarm at increasing tire imports. In the first quarter of 1947 imports of automobile accessories reached 2,746 tons, value, 92,990,000 cruzeiros, against 1,946 tons, value 56,650,000 cruzeiros, in the corresponding period of 1946.

Exports of Rubber Goods

Brazil's exports of rubber goods in the years 1941-194 , inclusive, were as follows:

	Tires and Tubes		Other Rubber Goods	
Year	Metric Tons	1,000 Cruz.	Metric Tons	1,000 Cruz.
1941 ...	41	826	120	3,528
1942 ...	1,976	54,466	227	12,404
1943 ...	6,644	186,994	804	37,979
1944 ...	5,020	150,436	865	56,857
1945 ...	3,339	108,039	1,256	107,477
1946 ...	1,518	53,241	897	76,809

According to the above figures, the peak of tire exports was reached in 1943 and that of other rubber goods in 1945. The decline in tire exports, which in 1946 were under the 1942 level is particularly marked.

ARGENTINA

Since March, crude rubber imports into Argentina have been unusually heavy. During the first quarter of 1947, 8,135 tons of rubber was imported, of which 7,704 tons entered in March. Estimated imports in the second quarter of 1947, on the basis of incomplete data from ships' manifests, were roughly 20,000 tons, according to a recent report from the United States Department of Commerce. Normal consumption requirements do not exceed 1,000 tons monthly, but June 30, 1947, stocks in the country are said to have been about 21,000 tons. Crude rubber imports in the period 1939-41 averaged a little over 10,000 long tons a year. The imports for all of 1946 came to only 5,015 tons.

According to Argentina's plan for domestic crude rubber supplies, 5,400 acres of guayule are to be planted in 1947, and increasing acreages in succeeding years. There seems to be some interest in the production of synthetic rubber also, but there is no local confirmation of an announcement by Pirelli that Argentina interests were considering the purchase of its synthetic rubber factory at Ferrara, Italy. The "Atanor" company has produced small experimental quantities of "Thiokol."

On March 10, 1947, the Central Bank announced suspension of all exchange permits for imports of rubber and, further, that the Argentine Trade Promotion Institute would maintain sufficient stocks of crude rubber to supply all future needs. However presentation of a plan for production of rubber products approved by the Rubber Division of the Secretariat of Industry and Commerce is necessary in order to be able to purchase from the Institute. On June 26 the Central Bank announced that exchange permits for imports of reclaimed rubber would again be authorized, but only for the local tire factories.

COSTA RICA

Under the stimulus of war demands, output of wild rubber in Costa Rica reached a record of 381 tons in 1943. In 1937 production had been only 14 tons; it increased gradually to 65 tons in 1941; the next year the figure was 238 tons. In 1944 and 1945 production was 240 and 270 long tons, respectively, but, in 1946, output dropped to a prewar level of 25 tons, despite the fact that Rubber Development continued to pay the price prevailing in 1945.

The area under plantation rubber in Costa Rica is now about 3,050 acres. In 1935, Goodyear Tire & Rubber Co. started a 2,500-acre plantation at Cairo, and now 650,000 rubber trees are planted, all of which will reach the tapping stage by 1950, though maximum production is not expected before 1955. Production here was 10 short tons in 1945 and 12 short tons in 1946, all of which was sold to a local manufacturer of rubber goods.

There is also the enterprise started in 1943 on 500 acres at Parrita by the United Fruit Co. This plantation will not be mature for several more years.

Finally, 18 Costa Rica farmers have cooperatively planted

about 55 acres with seedlings provided several years ago by the United States Department of Agriculture, which through its rubber experiment station at Turrialba and a nursery farm at Los Diamantes has been encouraging rubber planting by local farmers.

COLOMBIA

In the first quarter of 1947, local rubber goods manufacturers used 365,400 kilograms of natural rubber, in addition to 20,436 kilograms of synthetic rubber. Production during the period was estimated at 24,000 tires and 5,000 tubes; imports of rubber manufactures included 41,424 tires and 47,469 tubes. In the second quarter of 1947 consumption of natural rubber dropped to 212,770 kilograms; while synthetic rubber figures increased to 33,141 kilograms.

Plasticos Colombia was organized late in 1946 to manufacture plastics in the Medellin district of Colombia. The firm is reported to have a capital of 600,000 pesos.

ECUADOR

Exports of crude rubber from Ecuador in the first quarter of 1947 came to 69,533 kilograms; this figure indicates a considerable drop for the entire year from the exports for 1945 and 1946, when the total for each year was, respectively, 1,968,393 and 1,326,862 kilograms.

Since 1943 all crude rubber exports have been going to the United States.

In 1946 local industry consumed 150,000 kilograms of crude rubber. Imports of rubber manufactures included 15,000 automobile tires and 7,500 tubes, in addition to some industrial rubber goods. Most of the 3,500 kilograms of the latter type of goods bought here during 1946 were made locally.

FAR EAST

NETHERLANDS INDIA

Internal Warfare Harming Rubber Industry

A review of reports from the United States Department of Commerce and other sources on Netherlands India appearing during August and September, 1947, reveals the following facts.

About three-fourths of Java, including the principal seaports, 75% of the rubber area and most of the economic assets, is now under Dutch jurisdiction. Conditions in the reoccupied regions vary considerably; some have suffered comparatively little, in others there has been much deliberate destruction of factory buildings, warehouses and bridges; rubber has been uprooted, or ringed, and, especially of late, many rubber areas have been burned in pursuance of the scorched earth policy of the Indonesians, frequently by estate labor unions. In certain districts it is predominantly the Chinese who have been the victims of Indonesian hostility; in others European and particularly Dutch properties have been the chief targets.

The total area planted to rubber in Netherlands India in 1941 was about 616,000 hectares; in August, 1945, the figure was 560,000 hectares. The extent of the destruction by Indonesians since then has not yet been exactly determined, but it

has certainly decreased the acreage by some thousands of hectares more. The rubber area in Java in 1941 was about 240,000 hectares, over half of which was in West Java, and about one-third in East Java, with the smallest portion in Central Java. Some sources put the present acreage in East Java at only 62½% of what it was before the war. A Dutch report states that 31 rubber and coffee plantations in this section have been destroyed recently by republican troops. In West Java they destroyed 20 rubber plantations, the same source announced. A report from Malaya reveals that the scorched earth policy of the Indonesians has resulted in a loss of more than 6,500 hectares of rubber in West Java, and that the rubber factory, important estate buildings, and three power stations belonging to the Anglo-Dutch Plantation Co. have been destroyed.

News from Sumatra is still sparse, but it is learned that the large rubber plantations of the East Coast appear to have suffered little damage, but all stocks of rubber have been removed. A message from Medan says that the 70,000-acre estate of the Holland-American Plantation Co. is still in the hands of the Indonesians. On the other hand, the Amsterdam Rubber Co., which has the largest rubber interests in Netherlands India, announces that the greater part of the estates in Sumatra is intact and that it is expected to resume exports gradually. The concern estimates that roughly 15% of the rubber area on its East Coast Sumatra estates has been cut out; fortunately this seems to be chiefly older rubber; the remaining 85% consists largely of valuable young plantings.

A few other Dutch-owned plantations in the Medan area have been recovered, and production is expected to get under way shortly.

An official report puts the war damage to European agriculture in Netherlands India at 670,000,000 guilders, based on 1941 prices; rehabilitation is expected to cost 875,000,000 guilders, on the same basis. War damage to European rubber estates is put at 158,000,000 guilders, at prewar prices.

Native agriculture suffered to the extent of 1,400,000,000 guilders, on the basis of prewar prices. Native rubber holdings are said to be recovering fairly rapidly.

Present Economic Problems

The immediate economic problems facing the Dutch include organization of food distribution, provision of consumer goods, prevention of further damage to economic assets, prompt export of existing stocks of produce to provide means for importing manufactured goods and equipment for rehabilitation, and revival of production of produce still urgently needed on world markets.

These problems are rendered particularly difficult of solution by the fact that hostilities in various forms still continue, and that labor here is scarce and not too reliable. The shortage of labor is due to fear on the part of the more timid natives who dare not work for European enterprises and to hostility on the part of the more agressive elements. A specially disturbing factor in the labor situation is that estate labor unions have been taking an increasing part in destruction of estates so that there is constant danger of sabotage.

Late reports seem to be somewhat more optimistic. Netherlands India officials are said to have stated that they expected exports from Java and Sumatra from new production to reach 8,000 to 9,000 tons a month in the first quarter of 1948 and to continue to increase gradually thereafter.

To aid the rubber industry in rehabilitation, the tax of 10 cents (Dutch) per kilogram on plantation rubber was removed, as of August 5, 1947, so that this type of rubber is now completely exempt from export duties. The 5% ad valorem duty on native rubber continues in effect.

MALAYA

Recommendations to Better the Rubber Industry

Loans to meet the cost of replanting rubber, intensification of research to improve the quality of natural rubber, and assistance to small holders including postponement of premium payment on new land, provision of clones and budwood at cost, and instruction in budding and after-care, were the chief recommendations made by the Malayan Rubber Advisory Committee in its recently issued report. The Committee, which has been investigating the possibilities of improving the efficiency of the rubber growing industry in Malaya, suggests that capital for

the loans be obtained by arrangement between the Malayan Union Government and the new Colonial Development Corp., and, if possible, the Malayan Banks, with a separate local corporation to handle the loans.

As to research, the committee recommended that the Malayan Government should, as a matter of urgency, request the British Rubber Producers' Research Association and the Rubber Research Institute to draw up a scheme of research to improve the quality of natural rubber, in view of the threat of synthetic.

The urgent necessity of modernization of Malayan rubber was stressed, but it was added that this should be part of a long-term policy, to take place with reasonable speed and with due regard to financial considerations, the labor market, and probably future consumption.

The attitude of the United States on synthetic rubber was calculated to disturb rubber producers, the report added, but whatever America's policy in the future might be, Malaya must improve her position in what promised to become a most competitive market.

New Companies Organized

A new company has been formed in Mayala to preserve, concentrate, and ship latex collected from the estates of a number of plantation companies, most of which belong to the Harrison & Crosfield group. The concern to be known as H & C Latex Ltd., will set up two factories, one in Selangor, which together will have an annual capacity of 10,000 tons. Machinery has already been ordered, and it is hoped to be able to begin operations by the middle of 1948. Capital for the new company will be provided by the estates involved; it is understood that one of them, the London Asiatic & Produce Co., is to subscribe £50,000 of the capital.

Several companies are reported to have begun negotiations for amalgamations. Lanadron Rubber Estates is to purchase Cluny Rubber Estates, Rubber Estates of Johore, and Ledbury Rubber Estates. For this purpose the issued capital of Lanadron is to be increased from £360,000 to £607,543 and Rubber Estates of Johore will receive 86,685 Lanadron £1 shares on the basis of 46 of the latter for 100 of its own; Ledbury will get 111,858 shares on the basis of 103 Lanadron for 100 of its own, and Cluny will get 70 for each 100 of its shares.

Lumut Rubber Estates proposes to acquire the estates, assets, and undertakings of Dusun Durian Rubber Estates, whereby Lumut will own about 8,118 acres of planted land and have an issued capital of £485,482.

HONG KONG

Hong Kong's entrepôt trade in rubber has seemingly been strongly stimulated by the economic controls enforced by the Chinese Government, to judge by recent data as compared

with prewar figures. In 1940 the colony imported 2,527 tons of rubber and exported 205 tons, retaining 2,322 tons for the local rubber manufacturing industry, an amount in line with the average annual local rubber consumption of about 2,000 tons. But in 1946 about 7,670 long tons of rubber were imported, and 6,000 tons exported; while in the first half of 1947, 14,360 tons were imported, of which 9,500 tons were known to have been exported. The 1947 figures would suggest that the domestic industry retained 4,860 tons of rubber, but according to an Eastern press report only a small part of this rubber was actually reserved for local manufacture, with most of the remainder leaving the colony as undeclared exports.

Practically all of the rubber imported in the 1947 period came from Malaya and went to China.

EUROPE

GREAT BRITAIN

Increased Exports Necessary

The root cause of the present difficult economic and financial condition, precipitated by the acute dollar shortage throughout the world, was the growing lack of balance between productivity in the Western Hemisphere, particularly the United States, and that of the rest of the world, and here in Britain it was necessary to adjust standards of living and working conditions for the great and immediate effort that the situation demanded, Sir Stafford Cripps declared when he recently announced the government's new program for increased exports. He discussed total volume of exports, distribution among the various industries, direction to foreign markets, organization and supply of materials and labor. Turning to the rubber industry, he stated that it had exported manufactures (excluding tires) to an average value of £650,000 a month in the last quarter of 1946, equivalent to 222% of the 1938 volume and he urged that exports of rubber goods be increased to 340% of the 1938 volume by the middle of 1948 and to 425% by the end of that year.

In detail monthly rates of the new export targets for the rubber and allied industries in 1948 are as follows:

	Actual Exports Fourth Quarter, 1946 £	Targets—£	
		Middle of 1948	End of 1948
Tires	900,000	1,200,000	1,400,000
Footwear of all kinds	620,000	750,000	1,000,000
Asbestos manufactures	310,000	350,000	350,000
Rubber manufactures	650,000	1,000,000	1,250,000
Synthetic resins	310,000	350,000	350,000

The amounts are based on prices prevailing in the fourth quarter of 1946, but since prices are rising at the rate of over 1% a month, the actual value of exports in 1948 will no doubt have to be much higher than indicated above.

"Silopex" Insulations

"Silopex" varnished glass insulation fabrics and tapes, recently put on the market by Ioco, Ltd., Glasgow, Scotland, are made from woven, high tensile-strength glass fabric impregnated with silicone varnishes. Great resistance to heat and moisture as well as to strong acids (except sulfuric acid) and to alkalies is claimed for "Silopex." It will, however, soften in common organic solvents.

Fulmer Research Institute

The Fulmer Research Institute, near Slough, officially opened by Sir Stafford Cripps in July, is the only important research organization in Great Britain which provides a research center where experts with wide knowledge and experience as well as first-class facilities are available to firms for confidential research on their behalf, while the results of research and subsequent patents remain the sole property of these firms. The Institute, a non-profit organization, is now stressing metallurgical work, but it is open for consulation on every type of problem

Editor's Book Table

BOOK REVIEWS

"Rubber Red Book." 1947 Edition, Sixth Issue. Published by *The Rubber Age*, 250 W. 57th St., New York 19, N. Y. Cloth, 6 by 9 inches, 836 pages. Price $5.

As in previous editions, this issue of the Red Book shows expansion in contents, with a total increase in number of pages of 144, including advertisements. The system of organization and classification continues the same, although some new material has been added, including crude rubber-type descriptions, reclaimed rubber brand names and trade designations, and a classified list of reclaims according to application. The reprinting of the Scrap Rubber Specifications of the Rubber Reclaimers Association has been eliminated from the current edition.

Sections are devoted to rubber manufacturers in the United States and Canada, rubber machinery and equipment, accessories and fittings, rubber chemicals and compounding materials, fabrics and textiles, natural rubber and related materials, synthetic rubber and other rubber-like materials, reclaimed rubber, scrap rubber dealers, rubber latex, rubber derivatives, miscellaneous products and services, consulting technologists, branch offices and sales agents, technical journals, trade and technical organizations, and a who's who in the rubber industry. Subject and advertisers indices are appended.

"The Chemistry of Heterocyclic Compounds." Avery A. Morton. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y. Cloth, 9 by 6 inches, 556 pages. Price $6.

This is a complete and authoritative analysis of the heterocyclic compounds. It covers the methods of preparation of the various hetero rings, the chemical behavior of each system, and the compounds of major importance. The presentation is clarified by stressing throughout the text the similarity which various heterocyclic systems have to related functions in aliphatic and aromatic chemistry. Numerous references are included, and in addition each chapter is provided with many problems which review the text and check comprehension of the basic principles explained therein.

The subject matter covers the furan compounds; condensed furan systems; thiophene and condensed thiophene systems; pyrroles; di- and poly-pyrryl compounds; condensed pyrrole systems; pyrans, pyrones, and related compounds; the pyridine group; piperidine and related compounds; quinoline compounds; isoquinolines; acridines and other condensed compounds; azoles, azolones, and related systems and compounds; and azines and related compounds. This text will be of special interest and value to research chemists in the field of heterocyclic compounds, which include the rubber, the medicinal, the dye, and the photographic industries.

"Low-Pressure Laminating of Plastics." J. S. Hicks, assisted by R. J. Francis. Reinhold Publishing Corp., 330 W. 42nd St., New York 18, N. Y. Cloth, 9 by 6 inches, 168 pages. Price, $4.50.

This book is an extremely practical and comprehensive presentation of the low-pressure laminating field. Most of the information presented came from experience during the war and represents the result of intensive experimentation and pioneering work. Although emphasis is placed primarily on Fiberglas-resin laminates, the use of other materials is also covered. Complete and detailed descriptions of fabricating processes are given, with many illustrations showing progressive steps in the manufacture of various types of assemblies. For added clarity numerous references to published work and to sources of additional information appear throughout the text. Of further value from the practical standpoint are the many listings of sources of supply for the different materials and equipment mentioned in the text.

The volume comprises eight chapters covering the general field of plastics; the design and use of molds; resins, catalysts, and curing; reinforcements for plastics; illustrations of the fabrication of various assemblies; the joining and machining of plastics; and product analysis, with engineering and cost principles. An appendix presenting an outline for laboratory experiments is included, and there are patent and subject indices. The book should serve as a valuable text for students and beginners in the field and be a helpful addition to the libraries of plastics engineers and manufacturers of plastics equipment.

"Textile Fibers. Their Physical, Microscopical, and Chemical Properties." J. Merritt Matthews. Fifth Edition. Edited by Herbert R. Mauersberger. John Wiley & Sons, Inc., New York, N. Y. Cloth, 9 by 6 inches. 1148 pages. Price, $12.50.

Since this is the fifth edition of "Textile Fibers," the need of and demand for such a book is well established, and the main task of the reviewer is to evaluate this edition in terms of its predecessors. In this respect some interesting comparisons can be made between the fifth and fourth editions.

The fourth edition appeared in 1924 in the early days of the development of synthetic fibers. This fact is evident from a glance at the chapter headings, where the synthetics are dispensed with in 60 pages under the now somewhat archaic title, "Artificial Silks." Mr. Mauerberger and his co-authors were thus faced with the new synthetics as well as the increased volume of research on the natural fibers which has taken place in the last 20-odd years. Some indication of this increase can be gained from the fact that a casual perusal of the bibliographies at the end of each chapter (a most welcome innovation) showed that only about 10% of the references considered important by the present authors were available to Matthews in the preparation of the fourth edition; the fifth is a completely new book.

Since the two editions are of about the same size, it is obvious that something has been cut out of the fifth edition which was present in the fourth. This omission is the completeness of coverage of the material. Thus, while the fourth edition was a handbook of the work on physical and chemical properties of textile fibers, the fifth has an encyclopedic nature, mentioning much and giving references, but not giving sufficient coverage in itself. This change in approach has been necessitated by the bulk of material available, of course, rather than a change in attitude on the part of the authors who have, for the most part, done excellent jobs. However, it seems to the reviewer that in spite of the premium on space the authors have been guilty of a certain amount of redundancy. It would seem that one detailed chapter could take care of the available work on the physical properties of all textile fibers. Chapter 2 deals in general with the physical properties, but is not nearly detailed enough and hence of little value. For example, the mechanical properties of each fiber are treated separately, in different terms and with various degrees of success. A detailed, unified discussion of the data on the mechanical properties of all fibers would seem more economical and offer more chance for comparisons and contrasts between individual fibers, matters of some importance in a period of competitive selection. The same holds true for moisture adsorption and other properties.

The fourth edition contains a chapter on chemical treatment for flame and waterproofing. The fifth does not. In view of the large amount of work done on coating and treating fibers and fabrics in recent years for the purpose of moth, flame, water, mildew, etc. proofing this omission is rather disconcerting.

The contents of the book are as follows and give an indication of its scope: Chapters 1-3, introductory material; 4-11, natural cellulosic fibers; 12-16, wool, hair and fur fibers; 17, silk 18-20, synthetic fibers; 21, mineral and inorganic fibers; 22-24, indentification, analysis and testing methods.

In summary, despite various possible criticisms, the authors in general and Editor Mauersberger in particular have done an excellent job in presenting a volume for which there is a decided need, as previous editions are hopelessly antiquated. This book belongs in any textile library.

HOWARD J. WHITE, JR.

NEW PUBLICATIONS

"Barrett Rubber Compounding Materials." Rubber Laboratory Release No. 7, September, 1947. Barrett Division, Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y. 18 pages. Extensive laboratory test data appear on the use of Bardol and Cumar resin CX in Butyl inner tube stocks and on the use of Dispersing Oil No. 10 in a Butyl mineral-filled red recipe. The three materials are shown to be effective softeners in these applications.

"'Thiokol' Synthetic Rubber, Type ST." Thiokol Corp., Trenton 7, N. J. 13 pages. This bulletin offers information on the general properties of "Thiokol" Type ST, the physical characteristics of the crude material, compounding and curing, its processing, and some basic recipes.

Publications of Standard Oil Co. (Indiana), 910 S. Michigan Ave., Chicago 80, Ill. **"Indonex in Low Hardness Mechanical Goods."** Circular No. 13-12, June 16, 1947. 3 pages. **"Indonex in Neoprene Mechanical Goods."** Circular No. 13-13, June 16, 1947. 4 pages. **"Indonex Plasticizers in Hycar OR-15."** Circular No. 13-14, August 10, 1947. 8 pages. **"Indonex Plasticizers in Natural Rubber-Reclaim Mechanical Goods and Carcass Compounds."** Circular No. 13-15, August 20, 1947. 5 pages. **"Indonex Plasticizers in Hard Rubber Compounding."** Circular No. 13-16, October 3, 1947. 3 pages. These bulletins give the properties of the different Indonex grades and cover the use of these materials in various types of stocks, as indicated by the titles. Test data and properties obtained are also given. **"Indonex R-10 Light Process Oil."** Circular No. 13-17, October 30, 1947. 6 pages. This bulletin describes a new synthetic light process oil for use as a rubber plasticizer. Properties of the oil are given together with information and test data on its use in GR-S, white natural rubber, neoprene, Perbunan, and Hycar stocks.

"Bulk Handling of Carbon Black." B. A. Wilkes and S. V. Stoddard. Godfrey L. Cabot, Inc., 77 Franklin St., Boston 10, Mass. Volume II, No. 3, September, 1947. 20 pages. This illustrated booklet discusses the advantages of a bulk handling system for carbon black, bulk *vs.* bag handling cost considerations, and the types of bulk handling equipment, with drawings of the different types of conveyers and their advantages.

Bulletins of Baldwin Locomotive Works, Philadelphia 42, Pa. **"Baldwin Tate-Emery Air Cell."** Bulletin 264. 4 pages. This describes the Air Cell, a tension and compression load-weighing device which extends the precision range of testing machines to low load values. **"Baldwin SR-4 Load Cell."** Bulletin 271. 2 pages. Covered are five sizes of the cells which translate changes in tensile or compression loads into changes in electrical energy. **"Baldwin SR-4 Fluid Pressure Cell."** Bulletin 270. 2 pages. This treats of five sizes of these cells which convert changes in pneumatic or hydraulic pressures in pressure vessels, pipe lines, etc., into changes in electrical energy.

"Shell Dutrex 20, Dutrex 25—Plasticizers for Vinyl Chloride Resins." Shell Oil Co., Inc., 50 W. 50th St., New York 20, N. Y. 24 pages. This booklet presents the properties of Dutrex 20 and 25; their use as plasticizers for polyvinyl chloride, including compatibility, properties obtained, volatility, extraction loss, electrical properties, and effect of sunlight and aging; use of Dutrex 20 in mineral filled stocks, in phonograph record stocks, and to improve "lacquer lifting" tendencies; and compounding and testing procedures.

"Tonox in Tires and Footwear." Compounding Research Report No. 6. Naugatuck Chemical Division, United States Rubber Co., Rockefeller Center, New York 20, N. Y. 8 pages. Data shows that Tonox improves abrasion resistance and flex life, reduces hysteresis, activates thiazole cures in natural rubber tread stocks, and prevents loss of surface luster in footwear compounds.

"The Apparent Density of Light Magnesium Oxides." Bulletin 47-3. General Magnesite & Magnesia Co., Architects Bldg., Philadelphia 3, Pa. 4 pages. This bulletin, in explaining the use of the term "light" for magnesium oxides, contains graphs comparing the apparent density of the company's light calcined magnesia with competitive magnesias in both loose and compacted forms.

"Hycar Latices." Service Bulletin 47-H1, October 1, 1947. B. F. Goodrich Chemical Co., Rose Bldg., Cleveland 15, O. 10 pages. This bulletin gives data on the properties of the various Hycar latices, their use for coating and impregnation, the dispersions used in compounding the latices, and compounding procedures for different applications. A list of suppliers of the various compounding materials is also included.

"Hercules Synthetic Resins." Hercules Powder Co., Wilmington, Del. 18 pages. This booklet gives a description of the properties and uses of all Hercules synthetic resins currently available. The resins covered include the Cellolyns, the methyl esters of rosin, ester gums, Flexalyn resins, Lewisols, Pentalyns, Petrex resins, Poly Pale Esters, and Staybelite esters.

Publications of Witco Chemical Co., 295 Madison Ave., New York, 17, N. Y. **"Witco Pigments in Rubber."** Bulletin 47-1. 36 pages. This bulletin gives the properties of the company's carbon blacks and inorganic pigments and presents extensive test data, by means of tables and graphs, on their use in natural rubber. Various blacks are compared in both natural and 70:30 natural-GR-S rubbers. Several calcium carbonate pigments are compared with carbon blacks and with other inorganic pigments. **"Reinforcing Furnace Blacks."** Technical Service Report R-5. 7 pages. Test data are presented comparing the results obtained with four standard grades of furnace and channel black, three new reinforcing furnace blacks, and Experimental Black 13-J.

Publications of R-B-H Dispersions, Bound Brook, N. J. **"An Evaluation of Resin 510 in Buna N Molding and Calendering Compounds."** L. J. Radi. 4 pages. Tests, results and data are presented showing the effect of Resin 510 on the processing and properties of nitrile rubbers, as compared with results obtained using pinene-type resin, heavy pine tar, coumarone-indene resin, and the methyl ester of rosin. **"Glossary for the Protective Coatings Industry."** L. J. Radi. 62 pages. This glossary deals particularly with terms used in the field of paints and allied coatings, but some definitions relating to plastics, rubber, and chemical terms are included.

Publications of The British Rubber Development Board, 19 Fenchurch St., London, E.C.3, England. Positex Pamphlets Nos. 2—6, by C. M. Blow. **"The Compounding, Pigmenting and Thickening of 'Positex.'"** 8 pages. **"'Positex' in the Woollen and Worsted Industries."** 12 pages. **"'Positex' Applied to Cotton, Linen, Sisal or Jute Yarns and Fabrics."** 12 pages. **"'Positex in the Manufacture and Treatment of Felts."** 7 pages. **"'Positex' as a Textile Printing Paste."** 8 pages. **"A.S. T.M. Standards on Adhesives."** July, 1947. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Paper, 6 by 9 inches, 50 pages. Price, $1.25. **"Advances in Sales Management, Marketing and Packaging.** A Checklist of Significant AMA Publications." American Management Association, 330 W. 42nd St., New York 18, N. Y. 8 pages. **"The New Hobbs Tri-Power Die Press."** Hobbs Mfg. Co., Worcester 5, Mass. 4 pages. **"Eriez Non-Electric Permanent Magnetic Separators."** Eriez Mfg. Co., Erie, Pa. 4 pages. **"List of Inspected Appliances** Relating to Accident Hazard, Automotive Equipment, Burglary Protection." September, 1947. Underwriters' Laboratories, Inc., 207 E. Ohio St., Chicago 11, Ill. 88 pages.

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Neoprene Fishing Lures

(Continued from page 402)

ficiently life-like to fool the craftiest trout or bass. The grasshoppers, made in three sizes, have accurately shaped and colored bodies, and their ready-to-jump position adds to their realism. The stone flies in the nymph stage, made in three different colors, have flat, segmented bodies shaded darker on top than on the underside. The flexible legs and tail give this lure a most realistic appearance.

The first of these lures was made back in 1939, and the process developed slowly as a hobby. In the Spring of 1945, the Mimicry Co., was able to make the lures cheaply enough to be sold commercially. The wartime shortages of natural rubber latex made it necessary to find another material that could be used. Experiments proved that neoprene met all the requirements and withstood all field tests.

Market Reviews

Crude Rubber

Commodity Exchange

Week-End Closing Prices

1947	Sept. 27	Nov. 1	Nov. 8	Nov. 15	Nov. 22	Nov. 29
Nov.	16.80	23.00	24.00	23.50	23.00	....
Dec.	16.55	21.40	22.75	21.60	22.50	22.00
1948						
Jan.	16.45	20.55	22.00	21.35	22.00	21.65
Feb.	16.45	19.85	21.40	21.20	21.65	21.35
Mar.	16.35	19.74	21.30	21.10	21.55	21.22
Apr.	16.30	19.25	20.70	20.70	21.30	20.85
May	16.25	19.15	20.60	20.60	21.20	20.70
June	16.25	19.00	20.10	19.95	21.10	20.44
July	16.25	18.90	20.00	19.70	21.00	20.34
Aug.	16.25	18.80	19.85	19.70	20.85	20.10
Sept.-Dec.	16.25	18.70	19.85	19.60	20.75	20.00
1949						
Jan.	16.25	18.70	19.75	19.60	20.75	20.00

THE crude rubber futures market on the Commodity Exchange was steady during November. Trading was active during the first part of the month as prices moved upward, reflecting the strength of the physical market and expectations of future government stockpile purchases. After a peak was reached on November 12 of 25.00¢ for November futures, a reaction set in, and prices dropped as profit-taking took place. After declining to 22.50¢, November futures rose to 23.00¢ and remained firm during the remainder of the month. Trading was fairly active during the last two weeks and was featured by lifting of hedges against sales in the physical market and by an increase in speculative buying. Most interest was displayed in December, March, May, and July futures. Rubber sold on the futures market during November totaled 20,920 tons, a drop from October's record volume of 28,150 tons, although November 19 showed the most active trading since the reopening of the Exchange.

Stocks of rubber in the Far East are reported to be low, and a tight supply situation is foreseen for the next few months. A report from Batavia, however, foresaw rapid improvement in the Netherlands India rubber production provided that various measures taken by the authorities have the desired effects. According to an official spokesman, the Netherlands India Rubber Fund bought a total of 30,723 tons of rubber during the first eight months of this year. The export from Palembang in Southern Sumatra, under Indonesian Republican supervision, amounted to 6,000 tons in the first six months of 1947, according to reliable estimates.

On the other hand J. G. Loeber, writing in Lockwood's Rubber Report for November, states that resumption of work on the rubber plantations in East Java is still practically impossible. West Java is partially and slowly resuming its production activities. In Sumatra the two regions now of some importance for estate rubber are the East Coast district and Palembang. According to Mr. Loeber, Palembang is only of minor importance as regards estate rubber, although its native rubber has large possibilities. The East Coast of Sumatra is now making headway, the report continues, and many estates are starting or will be able to start production within a couple of months.

The London rubber market was featured by accentuated demand for near deliveries which caused some price advances. This demand is due to the steady high level of United States rubber consumption, the improvement in demand from other countries, the regular Russian purchases in Singapore, and the allocation by the French Government to buy some 11,000 tons of rubber from Malaya in addition to the supplies from French Indo-China.

Fixed Government Prices*

Guayule

Guayule *(carload lots)*	$0.17½

Latex

Normal *(tank car lots)*	.30¾
Centrifuged *(tank car lots)*	.32½

Plantation Grades

No. 1X Rubber Smoked Sheets	.23
1X Thick Pale Latex Crepe	.29
1 Thick Pale Latex Crepe	.29
2 Thick Pale Latex Crepe	.28½
3 Thick Pale Latex Crepe	.28¼
1 X Thin Pale Latex Crepe	.29
1 Thin Pale Latex Crepe	.29
2 Thin Pale Latex Crepe	.28½
3 Thin Pale Latex Crepe	.28¼
Liberian A	.28⅝
AA	.29
RCMA Watermarked Crepe No. 16	.37⅞
17	.32⅜
18	.30⅞
Sole Crepe Trimmings	25½
No. 1X Thin Pale Latex Crepe Trimmings	.28½
1X Borwn Crepe	.21⅞
2X Brown Crepe	.21⅝
2 Remilled Blankets (Amber)	.21¾
3 Remilled Blankets (Amber)	.21⅝
Rolled Brown	.185

Synthetic Rubber

GR-M (Neoprene GN)	.27½
GR-S (Buna S)	.18½
GR-I (Butyl)	.18½

Wild Rubber

Upriver Coarse (crude)	.12⅝
(Washed and dried)	.20¼
Islands Fine (crude)	.14⅝
(Washed and dried)	.22½
Caucho Ball (crude)	.11⅝
(Washed and dried)	.19½
Mangabiera (crude)	.08½
(Washed and dried)	.18

* For a complete list of all grades of rubbers see Rubber Reserve Co. General Sales and Distribution Circular, July 1, 1945, as amended.

New York Outside Market

Week-End Closing Prices

	Sept. 27	Nov. 1	Nov. 8	Nov. 15	Nov. 22	Nov. 29
No. 1 Ribbed Smoked Sheets:						
Nov.	16.88	22.25	24.00	23.50	23.50	22.75
Dec.	16.88	21.63	23.50	22.00	22.50	22.25
Jan.-Mar.	....	20.00	22.25	21.25	22.13	21.88
Apr.-June	....	19.25	20.38	20.75	21.50	21.25
No. 3 Ribbed Smoked Sheets:	16.75	20.50	23.00	21.50	22.50	21.75
No. 2 Amber	13.50	17.25	18.50	18.50	18.25	18.00
Flat Bark	11.63	15.00	16.50	15.75	15.10	15.25

THE crude rubber spot market during November was steady and relatively quiet, paralleling developments in the futures market. Spot stocks were scarce, and offerings were firm. Prices moved irregularly upward and reached a peak on November 12 when the spot price for No. 1 R.S.S. reached 25.00¢, December sold at 23.50¢, January to March at 22.75¢, and April to June at 21.75¢. No. 3 R.S.S. sold for 23.00¢ on November 12; No. 2 Amber was quoted at 19.00¢, and Flat Bark sold at 17.00¢. Factory demand was moderate throughout the month, although the large consumers dropped out of the market temporarily when prices hit their peak levels. During the latter part of November, spot prices held steady in the 22.75-23.50¢ range, and the market was quiet.

SCRAP RUBBER

A SLIGHTLY improved tone was noted during November in the scrap rubber market for tubes, both at Akron and in the East. The better demand caused dealers to raise their prices for mixed auto tubes to 4¢ a pound; whereas previously Akron dealers had quoted 3¢ and Eastern dealers had only nominal quotations. The price for red passenger tubes also advanced from a nominal quotation to 5¢ a pound, but prices for black passenger and truck tubes remained steady at 3.75¢.

The tire market, while mainly inactive, was said to be slightly improved in some eastern sections, although no changes in prices took place. This improvement was said to result from the desire of some reclaimers to stock up on needed scrap before the onset of freezing weather. Total absorption of scrap tires was still claimed to be negligible despite the better market tone.

Some peelings are being moved for export but the market abroad is still uncertain as a result of credit shortages.

Following are dealers' buying prices for scrap rubber, in carload lots, delivered points indicated:

	Eastern Points	Akron, O.
	(Net per Ton)	
Mixed auto tires	$10.00	$12.00
Truck and bus tires	nom.	nom.
Beadless tires	nom.	nom.
S.A.G. passenger (natural)	13.50	13.50
(Synthetic)	nom.	nom.
Truck (natural)	12.50	12.50
(Synthetic)	nom.	nom.
No. 1 peelings (natural)	42.50	42.50
(Synthetic)	nom.	nom.
(Recap.)	nom.	nom.
No. 2 peelings (natural)	27.50	27.50
(Synthetic)	nom.	nom.
(Recap.)	nom.	nom.
No. 3 peelings (natural)	25.00	25.00
(Synthetic)	nom.	nom.
	(¢ per Lb.)	
Mixed auto tubes	4.0	4.0
Red passenger tubes	5.0	5.0
Black passenger tubes	3.75	3.75
Truck tubes	3.75	3.75
Mixed puncture-proof tubes	nom.	nom.
Air brake hose	nom.	nom.
Rubber boots and shoes	nom.	nom.

RECLAIMED RUBBER

THE favorable condition prevailing in the reclaimed rubber market continued during November. The reduced demand apparent during the late summer months ended in October when sales showed a definite improvement. November sales were also encouraging, and no let-down in demand is anticipated for the next few months at least. Production of reclaim continues at a high level, and exports remain at the 2,000,000-pound-a-month level.

Final August and preliminary September statistics on the reclaim industry are now on hand. Production of reclaimed rub-

ber in August was 21,658 long tons; consumption, 21,093 tons; exports, 1,414 tons; and month-end stocks, 40,130 tons. Preliminary figures for September show a production of 22,723 long tons, consumption, 23,879 tons; exports, 902 tons, and end-of-month stocks, 38,938 tons.

There were no changes in prices of reclaimed rubber during November.

Reclaimed Rubber Prices

	Sp. Gr.	¢ per Lb.
Whole tire	1.18-1.20	8 / 8.5
Peel	1.18-1.20	9 / 9.5
Inner tube		
Black	1.20-1.22	12.75/13.25
Red	1.20-1.22	13.5 /14
GR-S	1.18-1.20	9.5 /10
Butyl	1.16-1.18	8.5 / 9
Shoe	1.50-1.52	8.25/ 8.75

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

COTTON AND FABRICS

New York Cotton Exchange Week-End Closing Prices

Futures	Sept. 27	Oct. 25	Nov. 1	Nov. 8	Nov. 15	Nov. 22
Jan.	30.81	32.77	32.39	32.76	33.24	34.78
Mar.	30.81	33.01	32.59	32.89	33.66	34.87
May	30.65	32.91	32.48	32.82	33.48	34.36
July	30.24	32.02	31.70	32.10	32.56	33.08
Sept.	29.25	30.41	30.18	30.40	30.95	31.00
Nov.	28.63	29.42	29.25	29.35	29.96	29.71

AFTER a slow start the cotton market showed lively trading during November, with prices moving steadily upward. The market was thin during the first week of the month, and prices were irregular in what was described as a technical readjustment to the gains made in October. Trading was dull as the market awaited the President's message to Congress. The message, when delivered, was interpreted by cotton traders as another indication of the acute scarcity of cotton, and prices began their steady advance. Most observers seemed unconcerned over the possible passage of legislation covering control of commodity exchanges and allocation of commodities at mill levels. Although they felt that prices may eventually sell off as a result of these factors, they believe the effect has already been partially discounted, and the drop, if it comes, will not be too severe. This view was strengthened by the strong statistical position of cotton and the continuing high mill demand.

The 15/16-inch middling spot price was 32.97¢ on November 1, hovered around the 33¢ level for a week, and then rose steadily reaching a monthly peak of 36.75¢ on November 28 and closing the month at 36.25¢. February futures prices paralleled the spot market, beginning at 32.49¢ on November 1, rising to a peak of 36.06¢ on November 28, and closing the month at 35.53¢.

A total cotton crop of 11,505,000 bales was predicted by the Crop Reporting Board of the United States Department of Agriculture, based on conditions as of November 1. This compares with last year's exceptionally small crop of 8,640,000 bales, and with the 1936-1945 ten-year average of 12,390,000 bales. Although the 1947 crop is estimated at about one-third larger than last year's, the indicated total supply of cotton for the current season is about 14% smaller than it was last season and the smallest since the season of 1923-24. This reduction in total supplies reflects a sharp drop in carry-over supplies last season to 2,500,000 bales, compared with 7,300,000 bales a year earlier.

Fabrics

Advancing prices featured the wide and heavy industrial gray goods market during November. Although some houses remained withdrawn pending announcement of higher prices, most booked yardages at prices anywhere from 1-3¢ a pound higher. Most active selling covered the wide sateens, broken drills and twills, and a variety of ducks. Demand was heavy and the market was well sold up through the first quarter of 1948. Active business in wide sateens was booked with the coating trade for delivery in the second quarter at prices up 1-2¢ a yard. The coating trade was also active in taking forward contracts on broken twills.

Sellers reported having sold more than 1,000,000 pounds of chafer fabrics for second-quarter delivery at prices up 2¢ a pound. Sales for late first-quarter delivery were put through on belting ducks at price increases of 1¢ a pound, although some sales on hose ducks were reported at unchanged prices. Offerings of enamelling ducks were around the market for March and April deliveries at prices up 1⅛¢ a pound.

Only very small quantities of print cloths were available for spot delivery, and most of these goods on the market were found to be second hands. Mills appeared reluctant to offer additional print cloths for third-quarter deliveries. Sheetings were scarce and showed price advances for the second quarter. Stronger prices were noted in the osnaburg market although movement of goods was not great.

RAYON

TOTAL October domestic rayon shipments amounted to 84,500,000 pounds, 3% above the September level and 12% above that of October, 1946. For the first 10 months of 1947 domestic deliveries of rayon totaled 780,000,000 pounds, 11% above shipments in the 1946 period. Rayon filament yarn shipments in October were 63,400,000 pounds, of which 43,800,000 pounds were viscose and cupra and 19,600,000 pounds were of acetate. Shipments of rayon staple plus tow in October reached 21,100,000 pounds, of which 15,600,000 pounds were viscose and 5,500,000 pounds were acetate staple. Total rayon filament yarn stocks held by producers at the end of October amounted to 8,100,000 pounds, consisting of 5,600,000 pounds of viscose and cupra and 2,500,000 pounds of acetate.

Third-quarter filament yarn shipments to tire manufacturers hit 57,800,000 pounds, a new high. For the first nine months of 1947, filament yarn shipments to the tire industry totaled 169,700,000 pounds, 7% above the comparable 1946 period. Rayon and nylon tire fabric and cord production for the second quarter of 1947 was 53,000,000 pounds, which, when added to the production of cotton tire fabric and cord, gave a total production of 146,000,000 pounds for the second quarter. Production of cotton tire fabric in the second quarter totaled 69,000,000 pounds, while 24,000,000 pounds of cotton tire cord were produced.

Rubber Dispersions

(Continued from page 372)

dent of Latex Seamless Products Co., spoke on "Aqueous Rubber Dispersions."

In his preliminary remarks Mr. Pinhasik reviewed the many types of rubber dispersions used during the war in place of natural rubber latex and noted that most of these dispersions were made from reclaimed rubber. The speaker then gave a detailed account of the early developments in dispersions made by W. B. Pratt, and the refinements and improvements which followed. This was followed by a brief discussion of typical procedures and equipment now being used for manufacturing dispersions, and the different types of additives employed. A table was presented comparing physical properties of a typical rubber dispersion with a typical reclaimed rubber dispersion. The talk was concluded with a discussion of the applications for the various dispersions, using sample products to illustrate each application.

After dinner, Raymond V. Darby, chairman of the Los Angeles County Board of Supervisors, spoke on the functions of the Los Angeles County government, with emphasis on management and maintenance of water systems, sewage disposal units, roads, freeways, and airports. A guest of honor at the meeting was George Farwell, president of the Northern California Rubber Group.

Rubber Equipment Discussed

THE Connecticut Rubber Group held its first meeting of the current season on November 14 at General Electric Co.'s Monogram Hall, New Haven, Conn., with some 100 members and guests attending. At the technical session Edward S. Thompson, of Farrel-Birmingham Co., Inc., spoke on "Rubber Equipment Design" and discussed the principles of calender design, roll pressurers, and roll crowns. Donald Chase, also of Farrel-Birmingham, spoke on the "Mill Room of the Future" and said that the use of pelletized rubber is the means to insure fast, continuous processes for cost reduction.

At the business meeting following the technical session, the Group's new officers were introduced, reports were heard from the secretary, the treasurer, and the essay committee, and the subject of dinner-meetings was discussed and referred back to a committee for further work.

Science and Living

THE Ontario Rubber Section held a dinner-meeting on November 14 at the McMaster University, Hamilton, Ont. Approximately 55 members attended and heard J. Thwaites, chief electronics engineer of Canadian Westinghouse, Ltd., speak on "Science and Living." Mr. Thwaites told of some of his work in connection with radar and electronics during the past war. He expressed a belief that on numerous occasions Divine guidance was given some of the Allied scientists because a number of the most successful equipment used in connection with radar work was entirely opposed to the ordinary laws of science,

(Continued on page 424)

COMPOUNDING INGREDIENTS

Current Quotations*

Abrasives

Pumicestone, powdered	lb.	$0.03⅜ /	$0.06
Rottenstone, domestic	ton	36.00 /	43.00

Accelerators, Organic

A-10	lb.	.40 /	.47
A-19	lb.	.52 /	.58
A-32	lb.	.59 /	.69
A-77	lb.	.42 /	.55
A-100	lb.	.42 /	.55
Accelerator 8	lb.	.75	
49	lb.	.40 /	.42
552	lb.	1.63	
808	lb.	.59 /	.61
833	lb.	1.13 /	1.15
Acrin	lb.	.65	
Advan	lb.	.55	
Aero AC 50	lb.	.46 /	.52
Altax	lb.	.35 /	.445
Antox	lb.	.54 /	.56
Arazate	lb.	1.53	
Beutene	lb.	.59 /	.64
B-J-F	lb.	.34 /	.39
Butasan	lb.	1.10	
Butazate	lb.	1.10	
Butyl Eight	lb.	1.00 /	1.05
Zimate	lb.	1.10	
Captax	lb.	.27 /	.345
C-P-B	lb.	1.95	
Cumate	lb.	1.60	
Cuprax	lb.	.60 /	.62
Diesterex N	lb.	.50 /	.57
DOTG (diorthotolylguanidine)	lb.	.44 /	.50
DPG (diphenylguanidine)	lb.	.39 /	.45
El-Sixty	lb.	.39 /	.46
Ethasan	lb.	1.10	
Ethazate	lb.	1.10	
Ethyl Selenac	lb.	1.60	
Thiurad	lb.	1.25	
Tuads	lb.	1.25	
Tuex	lb.	1.25	
Zimate	lb.	1.10	
Ethylidene Aniline	lb.	.42 /	.43
Formaniline	lb.	.36 /	.37
Good-Rite Erie	lb.	.60 /	.62
Hepteen	lb.	.42 /	.48
Base	lb.	1.80 /	1.90
M-B-T	lb.	.27 /	.33
M-B-T-S	lb.	.35 /	.41
Methasan	lb.	1.20	
Methazate	lb.	1.20	
Methyl Selenac	lb.	1.60	
Tuads	lb.	1.25	
Zimate	lb.	1.20	
Monex	lb.	1.25	
Mono-Thiurad	lb.	1.25	
Morfex 33	lb.	.60 /	.65
O-X-A-F	lb.	.38 /	.43
Pentex	lb.	.74 /	.84
Flour	lb.	.1225 /	.1325
Permalux	lb.	1.18 /	1.20
Phenex	lb.	.49 /	.54
Pipazate	lb.	1.53	
Polyac	lb.	1.40	
Rotax	lb.	.39 /	.42
S. A. 52, 62	lb.	1.25	
57	lb.	1.20	
66	lb.	1.60	
67, 77	lb.	1.10	
Satex	lb.	1.15	
Santocure	lb.	.53 /	.60
Selazate	lb.	1.60	
SPDX-G	lb.	.53 /	.58
Tellurac	lb.	1.60	
Tetrone	lb.	1.25	
A	lb.	1.85	
Thiocarbanilide	lb.	.34 /	.39
Thiofide	lb.	.35 /	.42
Thionex	lb.	1.25	
Thiotax	lb.	.27 /	.34
Thiurad	lb.	1.25	
Thiuram E	lb.	1.25	
M	lb.	1.25	
Trimene	lb.	.54 /	.64
Base	lb.	1.03 /	1.18
Triphenylguanidine (TPG)	lb.	.45 /	.50
Tuex	lb.	1.25	
2-MT	lb.	.58 /	.60
Ulto	lb.	.99 /	1.04
L	lb.	1.04	
Ureka	lb.	.55 /	.62
Blend B	lb.	.55 /	.62
C	lb.	.52 /	.59
Vulcanex	lb.	.45	
Z-B-X	lb.	2.45	
Zenite	lb.	.33 /	.35
A	lb.	.42 /	.44
B	lb.	.39 /	.41

Accelerator-Activators, Inorganic

Lime, hydrated	ton	8.00 /	12.25
Litharge, commercial	lb.	.166 /	.176
Eagle, sublimed	lb.	.17 /	.176
FBS	lb.	.17 /	.176
Red lead, commercial	lb.	.176 /	.19
Eagle	lb.	.18 /	.186
#2 RM	lb.	.18 /	.186
White lead, basic	lb.	.1575 /	.175
Eagle	lb.	.16 /	.165
National	lb.	.16 /	.175
Silicate	lb.	.16 /	.175
Eagle	lb.	.1685	
Zinc oxide, commercial†	lb.	.10 /	.12⅞

*Prices in general are f.o.b. works. Range indicates grade or quantity variations. Space limitation prevents listing of all known ingredients. Prices are not guaranteed and those readers interested should contact suppliers for spot prices.

†For trade names, see Color—White, Zinc Oxide.

Accelerator Activators, Organic

Activex	lb.	.20 /	.22
Barak	lb.	.60	
Bunac K-17	lb.	.17 /	.19
D-B-A	lb.	1.95	
Delac P	lb.	.45 /	.52
Double distilled cottonseed fatty acids	lb.	.1175 /	.14
Emery's 0-18 Elaine	lb.	.255 /	.375
S-24	lb.	.34 /	.43
Guantal	lb.	.43 /	.50
Laurex	lb.	.33 /	.35
Lead oleate	lb.	.2625	
MODX	lb.	.295 /	.345
Neo-Fat H.F.O.	lb.	.21 /	.22
1-60	lb.	.20 /	.21
1-65	lb.	.24 /	.25
Palmalene	lb.	.15	
Plastone	lb.	.27 /	.30
Ridacto	lb.	.22 /	.24
Stearex Beads	lb.	.147⁄8 /	.157⁄8
Stearic acid, single pressed	lb.	.335 /	.345
Double pressed	lb.	.34 /	.35
Triple pressed	lb.	.3625 /	.3725
Stearite	lb.	.147⁄8	
Tonox	lb.	.50 /	.59
Zinc stearate	lb.	.47 /	.48

Alkalies

Caustic soda, flake	100 lbs.	3.25 /	5.70
Liquid, approx. 50%	100 lbs.	2.25 /	2.35
Solid	100 lbs.	2.85 /	5.30

Antioxidants

Age-Rite Alba	lb.	2.20 /	2.30
Gel	lb.	.55 /	.57
H.P.	lb.	.58 /	.60
Hipar	lb.	.76 /	.78
Powder	lb.	.43 /	.45
Resin	lb.	.60 /	.62
D	lb.	.43 /	.45
Stalite	lb.	.43 /	.45
White	lb.	1.35 /	1.45
Akroflex C	lb.	.58 /	.60
Albasan	lb.	.69 /	.74
Aminox	lb.	.43 /	.52
Antisol	lb.	.23 /	.24
Antox	lb.	.54 /	.56
Aranox	lb.	2.15	
Betanox Special	lb.	.61 /	.70
B-L-E	lb.	.43 /	.52
Powder	lb.	.61 /	.70
B-X-A	lb.	.43 /	.52
Copper Inhibitor X-872-A	lb.	1.50	
Flectol H	lb.	.43 /	.50
Flexamine	lb.	.58 /	.67
Heliozone	lb.	.23 /	.24
Mekon micro-crystalline wax, amber	lb.	.14 /	.16
Black	lb.	.135 /	.155
Yellow	lb.	.155 /	.175
Neozone (standard)	lb.	.66 /	.68
A	lb.	.43 /	.45
C	lb.	.47 /	.49
D	lb.	.43 /	.45
Distilled	lb.	.48 /	.50
Parazone	lb.	.68	
Perflectol	lb.	.58 /	.65
Permalux	lb.	1.53 /	1.55
Rio Resin	lb.	.48 /	.50
Santoflex B	lb.	.43 /	.50
BX	lb.	.57 /	.64
Santovar-A	lb.	1.30 /	1.37
Santowhite	lb.	1.40 /	1.52
S.C.R.	lb.	.32 /	.34
Solux	lb.	1.48 /	1.50
Stabilite	lb.	.48 /	.50
Alba	lb.	.69 /	.74
L	lb.	.48 /	.50
Sunproof	lb.	.23 /	.28
Jr.	lb.	.17 /	.22
Thermoflex	lb.	1.48 /	1.50
A	lb.	.76 /	.78
C	lb.	.54 /	.56
Tonox	lb.	.50 /	.59
Tysonite	lb.	.215 /	.2225
V-G-B	lb.	.43 /	.52
Zenite	lb.	.37 /	.39

Antiseptics

Copper naphthenate, 6-8%	lb.	.21	
G-4	lb.	.95 /	1.40
G-11	lb.	4.50 /	4.75
Pentachlorophenol	lb.	.20 /	.25
Resorcinol, technical	lb.	.68	
Zinc naphthenate, 8-10%	lb.	.1975 /	.24

Blowing Agents

Ammonium bicarbonate	lb.	$0.064 /	$0.0975
Carbonate	lb.	.0825 /	0.095
Sodium bicarbonate	100 lbs.	1.85 /	2.35
Carbonate, technical	100 lbs.	1.08 /	4.13
Sponge Paste	lb.	.20	
Unicel	lb.	.60	
ND	lb.	1.00	

Bonding Agents

MDI	lb.	7.25 /	7.75
50	lb.	3.60 /	3.85
Ty-Ply Q. S.	gal.	6.75 /	8.00

Brake Lining Saturants

B.R.T. No. 3	lb.	.0175 /	.0185
Resinex L-5	lb.	.0175 /	.025

Carbon Blacks

Conductive Channel—CC

Continental R-20	lb.	.055 /	.102
R-40	lb.	.055 /	.102
Spheron C	lb.	.08 /	.125
I	lb.	.066 /	.111
N	lb.	.185 /	.25
Voltex	lb.	.15 /	.185

Easy Processing Channel—EPC

Continental AA	lb.	.055 /	.102
Kosmobile 77/Dixiedensed 77	lb.	.055 /	.102
Micronex W-6	lb.	.055 /	.097
Spheron #9	lb.	.06 /	.102
Witco #12	lb.	.055 /	.102
Wyex	lb.	.055 /	.117

Hard Processing Channel—HPC

Continental F	lb.	.055 /	.102
HX	lb.	.055 /	.117
Kosmobile S/Dixiedensed S	lb.	.055 /	.102
Micronex Mark II	lb.	.055 /	.097
Spheron #4	lb.	.06 /	.102
Witco #6	lb.	.055 /	.102

Medium Processing Channel—MPC

Arrow TX	lb.	.055 /	.117
Continental A	lb.	.055 /	.102
Kosmobile S-66/Dixiedensed S-66	lb.	.055 /	.102
Micronex Standard	lb.	.055 /	.097
Spheron #6	lb.	.06 /	.102
Witco #1	lb.	.055 /	.102

Conductive Furnace—CF

Statex A	lb.	.08 /	.10
Sterling I	lb.	.09	

Fine Furnace—FF

Statex B	lb.	.0525 /	.09
Sterling 99	lb.	.10	

High Elongation Furnace—HEF

Sterling K	lb.	.05 /	.09

High Modulus Furnace—HMF

Continex HMF	lb.	.16	
Kosmos 40/Dixie 40	lb.	.05 /	.075
Modulex	lb.	.05 /	.075
Philblack A	lb.	.05 /	.06
Statex 93	lb.	.05 /	.075
Sterling L	lb.	.05 /	.09

Semi-Reinforcing Furnace—SRF

Continex SRF	lb.	.035 /	.055
Essex	lb.	.035 /	.055
Furnex	lb.	.035 /	.06
Gastex	lb.	.035 /	.075
Kosmos 20/Dixie 20	lb.	.035 /	.055
Pelletex	lb.	.035 /	.075
Sterling R, S	lb.	.035 /	.075

Fine Thermal—FT

P-33	lb.	.05	

Medium Thermal—MT

Thermax	lb.	.03	

Chemical Stabilizers

Dutch Boy DS-207	lb.	.525	
Plumb-O-Sil	lb.	.26	
Tribase	lb.	.2225	
Lead stearate	lb.	.48 /	.50
Vanstay	lb.	.38 /	.40
White lead, basic	lb.	.1575 /	.175

Colors

Black

Lampblack, commercial	lb.	.07 /	.30

Blue

Du Pont	lb.	.945 /	3.95
Stan-Tone	lb.	1.40 /	4.40
Toners	lb.	.30 /	3.50

Brown

Mapico	lb.	.1135	

Green

Chrome	lb.	.10 /	.4275
Oxide	lb.	.30 /	.33
Du Pont	lb	1.10 /	3.20
Guignet's	lb.	.70	
Stan-Tone	lb.	1.60 /	3.60
Toners	lb.	.35 /	4.00

Orange

Du Pont	lb.	2.75 /	3.65
Stan-Tone	lb.	2.20	
Toners	lb.	.30 /	1.50

Red

Antimony crimson, 15-17%	lb.	.48	
Antimony, R.M.P. No. 3	lb.	.48	
Sulfur free	lb.	.52	
Cadmium red lithopone	lb.	1.10 /	1.50

Du Pont	lb.	$1.65	$1.80
Iron oxide	lb.	.0675	.1025
Mapico	lb.	.0885	.096
Rub-Er-Red	lb.	.0975	
Stan-Tone	lb.	1.10	2.20
Toners	lb.	.25	4.15

White

Lithopone, titanated			
Cryptone BT	lb.	.0725	.0825
Titanium pigments			
Rayox LW	lb.	.165	.175
R-110	lb.	.185	.195
Titanox-A series	lb.	.175	.185
Titanox-AA	lb.	.175	.185
B-30	lb.	.07	.075
C	lb.	.0675	.0725
RA, RA-10	lb.	.195	.205
RC types	lb.	.0675	.0725
Zopaque	lb.	.145	
Zinc oxide, commercial	lb.	.10	.12⅞
Azo ZZZ-11-44,-55	lb.	.10	.1025
-66	lb.	.1225	.125
35% leaded	lb.	.1175	.12
Eagle AAA, lead free	lb.	.10	.1025
35% leaded	lb.	.1175	.12
50% leaded	lb.	.12⅝	.12⅞
Florence Green Seal 8	lb.	.1175	.12
Red Seal-9	lb.	.1125	.115
White Seal-7	lb.	.1225	.125
Horsehead XX-4, -78, -166	lb.	.095	.0975
Kadox-15, -17, -72	lb.	.095	.0975
-25	lb.	.1175	.12
St. Joe, lead free	lb.	.09	.0925
Zinc sulfide, commercial	lb.	.10	.1075
Cryptone ZS-800	lb.	.10	.1025

Yellow

Cadmolith	lb.	.75	.85
Chrome	lb.	.26	.276
Du Pont	lb.	1.60	1.95
Mapico	lb.	.0685	.071
Stan-Tone	lb.	1.20	1.75
Toners	lb.	.50	1.37

Dispersing Agents

Darvan Nos. 1, 2	lb.	.19	.30
Stan-Chem	lb.	.1225	.2587
Triton R-100	lb.	.12	.25

Dusting Agents

Glycerized Liquid Lubricant, concentrated	gal.	1.50	
Lubrex	lb.	.25	.30
Mica	lb.	.0675	.075
Pyrax A	ton	11.50	
W. A.	ton	13.00	
Zinc Stearate	lb.	.47	.48

Extenders

Advagum 1098	lb.	.42	
1198	lb.	.40	
B.R.S. 700	lb.	.012	.018
B. R. T. No. 7	lb.	.0215	.0225
Dielex B	lb.	.06	
Extender 15	lb.	.32	
600	lb.	.208	
Factice			
Amberex Type B	lb.	.416	
Brown	lb.	.13	.35
Neophax A	lb.	.252	
White	lb.	.16	.37
Insulac W	lb.	.055	.06
Mineral Rubbers			
Black Diamond	ton	25.00	30.00
Extender 600	lb.	.1643	
Hard hydrocarbon	ton	32.00	34.00
No. 38	ton	25.00	
Parmr	ton	21.00	29.00
Multi-Plast	lb.	.0425	.0475
Naftolen HV	lb.	.11	.12
LV, MV	lb.	.0525	.0575
R-100	lb.	.11	.12
Nuba Nos. 1, 2	lb.	.029	
No. 3X	lb.	.0425	
Rubber Substitutes,			
Black	lb.	.09	.15
Brown	lb.	.105	.1875
White	lb.	.0975	.165
Synthetic 100	lb.	.41	
Vinosol Resin	lb.	.025	.035
Vistanex	lb.	.32	.36

Fillers, Inert

Asbestos fiber	ton	25.50	73.00
Barytes, floated white	ton	30.30	45.00
Off-color, domestic	ton	19.00	20.00
Blanc fixe, dry, precip.	ton	72.50	120.00
Clays			
Champion	ton	13.00	
Crown	ton	11.00	23.00
McNamee	ton	12.50	
Stellar-R	ton	50.00	
Flocks			
Cotton, dark	lb.	.095	.112
Dyed	lb.	.45	.85
White	lb.	.12	.20
Fabrifil X-24-G	lb.	.095	
X-24-W	lb.	.135	
Filfloc 6000	lb.	.16	
F-40-9000	lb.	.105	
Kalite	ton	26.00	
Lead sulfate, basic	lb.	.1525	.155
Lithopone, commercial	lb.	.06	.065
Albalith	lb.	.055	.0575
Astrolith	lb.	.055	.05⅞
Eagle	lb.	.0725	.075
Sunolith	lb.	.055	.05⅞
Mica	lb.	.0675	.075
Pyrax A	ton	$11.50	
W. A.	ton	13.00	
Silical	ton	$7.00	$55.00
Titanox-C, RCHT	lb.	.055	.0575
White lead, sublimed	lb.	.085	.09
Eagle	lb.	.085	.0875
Whiting, limestone	ton	10.00	28.00
Suprex White	ton	12.00	
Witco	ton	6.50	

Finishes

Black-Out	gal.	4.50	8.00
Flocks			
Cotton, dark	lb.	.095	.112
Dyed	lb.	.45	.85
White	lb.	.12	.20
Rayon, colored	lb.	.90	1.50
White	lb.	.75	1.25
Rubber lacquer, clear	gal.	1.00	2.00
Colored	gal.	2.00	3.50
Shoe varnish	gal.	1.45	
Talc	ton	11.00	30.00
Wax, Bees	lb.	.58	.73
Carnauba	lb.	.71	1.55
Montan	lb.	.45	.46
No. 118, colors	gal.	.86	1.41
Neutral	gal.	.76	1.31
Van Wax	gal.	1.25	1.30

Latex Compounding Ingredients

Accelerator 89	lb.	1.20	
122	lb.	1.30	
Advawet 10	lb.	.46	
Aerosol	lb.	.35	
Agchem RC-30 Series	gal.	.1425	.34
RC-109 Series	gal.	.235	.35
SA-9	gal.	.72	.74
-11, -21	gal.	1.10	1.12
-12	gal.	1.01	1.03
-16	gal.	.29	.31
AgeRite Dispersions	lb.	.60	2.25
Antox, dispersed	lb.	.54	
Aquarex BBX Concentrated	lb.	.78	
D	lb.	.71	
MDL Paste	lb.	.30	
ME	lb.	.87	
SMO	lb.	.50	
Areskap 50	lb.	.30	.38
100, dry	lb.	.60	.72
Aresket 240	lb.	.30	.38
300, dry	lb.	.60	.72
Aresklene 375	lb.	.42	.57
400, dry	lb.	.70	.84
Black No. 25, dispersed	lb.	.22	
Casein	lb.	.24	.2475
Darex Copolymer No. 3-L (total solids)	lb.	.445	.50
No. X 34-L	lb.	.445	.50
Dispersed sulfur No. 2	lb.	.10	.12
Ethyl Thiurad	lb.	1.25	
Factex Dispersion A.	lb.	.185	
Laton L	lb.	.075	.0775
Marmix	gal.	1.16	1.35
Micronex, colloidal	lb.	.06	.07
NA-11	lb.	.65	
pHR latex chemical	lb.	2.00	
Pip-Pip	lb.	1.63	
R-2 Crystals	lb.	1.55	
Resin V	lb.	.13	
S-1	lb.	.80	
Santomerse D	lb.	.43	.65
S	lb.	.13	.25
Setsit No. 5	lb.	.75	1.00
Stablex A	lb.	.90	1.10
B	lb.	.70	.90
G	lb.	.40	.50
Tepidone	lb.	.63	
Tergitol wetting agents	lb.	.265	.37
Zinc oxide, dispersed	lb.	.25	

Mold Lubricants

Aluminum stearate, precip.	lb.	.43	.50
Aquarex D	lb.	.75	
MDL Past	lb.	.32	
Carbowax compounds	lbs.	.24	.35
Colite Concentrate	gal.	.90	1.15
DC Mold Release Fluid	lb.	5.70	6.15
Emulsion No. 35	lb.	2.60	3.50
Glycerized Liquid Lubricant, concentrated	gal.	1.50	
Lubrex	lb.	.25	.30
Montan Wax	lb.	.45	.46
Para Lube	lb.	.046	.048
Rubber-Glo	gal.	.97	
Sericite	lb.	.0675	.075
Soapstone	ton	14.00	30.00
Sodium stearate	lb.	.19	.24

Odorants

Coumarin	lb.	2.75	3.30
Curodex 19	lb.	4.75	
188	lb.	5.75	
198	lb.	6.75	
Para-Dor A	lb.	2.00	2.50
C	lb.	2.75	3.25
E	lb.	.25	.55
Rodo No. 0	lb.	4.00	4.50
No. 10	lb.	5.00	5.50
Vanillin	lb.	3.00	4.65

Plasticizers and Softeners

Akroflex C	lb.	.53	.55
Arneel HT	lb.	.30	.35
T	lb.	.27	.32
TO	lb.	.17	.22
TOD	lb.	.23	.28
Aro Lene 1980	lb.	.10	0.20
Barak	lb.	$0.60	
Bardex	lb.	.05	$0.0525
Bardol	lb.	.0225	.03
B	lb.	.05	.0525
B.R.S. 700	lb.	.012	.018
Barium stearate	lb.	.47	.49
Bondogen	lb.	.55	.60
B.R.C. No. 20	lb.	.0105	.0115
B.R.H. No. 2	lb.	.0225	.0235
B.R.T. No. 7	lb.	.0215	.0235
B.R.V.	lb.	.03	.0375
Bunarex resins	lb.	.055	.115
Bunnatol G, S	lb.	.40	.50
Butac	lb.	.1061	.1436
Butyl Roleate	lb.	.16	.195
Calcium stearate	lb.	.44	.46
Carbonex Flakes	lb.	.03	.035
S Flakes	lb.	.0325	.0375
Plastic	lb.	.031	.0335
Contogums	lb.	.0675	.1025
Cumar EX	lb.	.0525	
MH	lb.	.065	.1175
V	lb.	.0975	.1275
Dibenzyl phthalate	lb.	.51	.59
Sebacate	lb.	.67	.74
Dibutyl phthalate	lb.	.32	.365
Sebacate	lb.	.7775	.7925
Dicapryl phthalate	lb.	.25	.30
Dielex B	lb.	.06	
Diethyl phthalate	lb.	.315	.385
Dimethyl phthalate	lb.	.235	.305
Dipentene 122	gal.	.60	.75
Dipolymer oil	gal.	.33	.38
Dispersing oil No. 10	lb.	.045	.0475
Double distilled cotton-seed fatty acids	lb.	.1175	.14
Duraplex C-50 LV, 100%	lb.	.25	.295
Dutrex 6	lb.	.025	.0375
Emery's 0-18 Elaine	lb.	.255	.3275
S-24	lb.	.34	.43
Flexol Plasticizer 3GH	lb.	.55	.60
3GO	lb.	.515	.60
4GO	lb.	.40	.47
8N8	lb.	.395	.465
DOP	lb.	.379	.424
TOF	lb.	.45	.52
Heavy Resin Oil	lb.	.015	.0225
Hercolyn	lb.	.1122	.1347
Herron-H.T.	lb.	.17	.23
Herron-Plas	lb.	.035	
Herron-Seal	lb.	.1125	.13
Herron-Wax	lb.	.045	
No. 6	lb.	.045	.0475
8	lb.	.0475	.05
Indonex	gal.	.115	.16
JMH	lb.	.65	.68
Lead oleate	lb.	.2625	
Magnesium stearate	lb.	.48	.49
Migralube	lb.	.30	
Multi-Plast	lb.	.0425	.0475
Naftolen HV	lb.	.11	.12
LV, MV	lb.	.0525	.0575
R-100	lb.	.11	.12
Neo-Fat H.F.O.	lb.	.21	.22
1-60	lb.	.20	.21
1-65	lb.	.24	.25
Neoprene Peptizer P-12	lb.	.75	.83
Nevillac 10°	lb.	.24	
Neville 465 Resin	lb.	.035	
R Resins	lb.	.085	.1375
Nevinol	lb.	.13	
Nevoll	lb.	.02	.025
Nevtex 10	lb.	.0775	.08
90	lb.	.20	
No. 1-D heavy oil	lb.	.04	
Palmalene	lb.	.15	
Para Resins 2457, 2718	lb.	.04	
Paradene Nos. 1, 2	lb.	.0525	
Nos. 33, 34	lb.	.0625	
No. 35	lb.	.0575	
Para Flux, regular	gal.	.17	.19
No. 2016	gal.	.19	.20
Para Lube	lb.	.046	.048
Paraplex A1-111	lb.	.21	.25
G-25, 100%	lb.	.75	
Paroils	lb.	.0975	.18
Picco 75	lb.	.105	
100	lb.	.105	.155
Piccocizer 30	lb.	.055	.06
Piccolastic Resins	lb.	.125	.205
Piccolyte Resins	lb.	.17	.205
Piccoumaron Resin 427	lb.	.11	.16
Resins	lb.	.055	.16
Piccovars	lb.	.0875	.155
Piccovol	lb.	.02	.0275
Pictar	gal.	.18	.23
Plasticizer 35	lb.	.205	.24
36	lb.	.305	.34
1889	lb.	.565	
1919	lb.	.55	
2069	gal.	.21	.23
2070	gal.	.25	.27
B	lb.	.35	.45
SC	lb.	.75	
Plastoflex No. 10	lb.	.20	
No. 20	lb.	.25	
Plastogen	lb.	.0775	.08
Plastone	lb.	.27	.30
R-19, R-21 Resins	lb.	.1075	
Reogen	lb.	.115	.12
Resin C pitch	lb.	.015	.021
R6-3	lb.	.38	.40
Resinex	lb.	.0275	.0325
L-4	lb.	.0175	.025

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A new booklet, "Witco Pigments in Rubber," has recently been prepared and released by the Witco Technical Service Laboratory.

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Dece

Ridbo
369
RPA
No.
No.
RSN
Rubbe
S-Pol
Santic
E-1
M-1
No.
Sebac
Solver
Staybe
Steare
Steari
Dou
Trip
Steari
Synpr
Synpr
Syn
Synthe
TR-11
Tricre
Turgu
Tyson
Vistac
No.
Wilma
X-1 re
XX-10
Zinc

Reclaim
Barde
Bardol
B
B.R.H
B.R.T
No.
B.R.V
BWH-
Dipent
Dipoly
Disper
Heavy
LX-83
-572
No. 1
No. 10
Picco
33
D-4
E-5
No.
Solven
S.R.O.
Wilcor
X-60 S
X-443

Reinforc
B.R.C.
Bunaro
Calcen
Carbon
S F
Pl
Clays
Aerf
Pa
Su
Alur
Baro
Buca
Cata
Chir
Dixi
Hyd
Hyd
L.G.
Para
Pigm
Witc
Cumar
MH
V
Darex
No.
G Res
Good-
Kalvar
Magne
Extr
Ligh
N
Hea
Med
Magne
Marbon
Type
Naftex
HM
-7
MPC
SRF
-7
Neville
Para
Picco
100
Piccoly
Piccou
Piccov
Resin

Ridbo 369	lb.	$0.08 / $0.09
369-F	lb.	.12
RPA No. 2	lb.	.65
No. 3	lb.	.46
No. 5	lb.	.57
RSN Flux	gal.	.10 / .19
Rubberol Compound	lb.	.185
S-Polymers	lb.	.44
Santicizer B-16	lb.	.52 / .57
E-15	lb.	.49 / .54
M-17	lb.	.46 / .51
No. 140	lb.	.3225 / .38
Sebacic acid	lb.	.48 / .55
Solvenol	gal.	.56 / .58
Staybelite Resin	lb.	.06 / .065
Stearex Beads	lb.	.14⅞ / .15⅞
Stearic acid, single pressed	lb.	.335 / .345
Double pressed	lb.	.34 / .35
Triple pressed	lb.	.3625 / .3725
Stearite	lb.	.14⅞
Synprolac	lb.	.185 / .195
Synprowax	lb.	.16
Syn Tac	lb.	.33 / .35
Synthol	lb.	.225
TR-11	lb.	.035
Tricresyl phosphate	lb.	.31 / .375
Turgum S	lb.	.0886 / .1086
Tysonite	lb.	.215 / .2225
Vistac No. 1	lb.	1.21 / 1.41
No. 2	lb.	1.61 / 1.75
Wilmac D-X	lb.	.09 / .10
X-1 resinous oil	lb.	.011 / .016
XX-100 Resin	lb.	.0525
Zinc laurate	lb.	.45 / .46

Reclaiming Oils

Bardex	lb.	.05 / .0525
Bardol	lb.	.0225 / .03
B	lb.	.05 / .0525
B.R.H. No. 2	lb.	.0225 / .0235
B.R.T. No. 3	lb.	.019 / .02
No. 4	lb.	.02 / .021
B.R.V.	lb.	.03 / .0375
BWH-1	lb.	.11
Dipentene 122	gal.	.60 / .75
Dipolymer oil	gal.	.33 / .38
Dispersing Oil No. 10	lb.	.045 / .0475
Heavy Resin Oil	lb.	.015 / .0225
LX-83	gal.	.15 / .23
-572	gal.	.20 / .28
No. 1 heavy oil	lb.	.04
No. 1621	lb.	.02 / .0275
Picco C-6, -28, -32	gal.	.33 / .38
33	gal.	.19 / .24
D-4	gal.	.19 / .24
E-5	gal.	.17 / .22
No. 523 H.S. oil	gal.	.22 / .27
Solvenol	gal.	.56 / .58
S.R.O.	lb.	.015 / .0225
Wilcor Nos. 111, 151	gal.	.26 / .30
X-60 Solvent	gal.	.20 / .28
X-443	gal.	.20 / .27

Reinforcers, Other Than Carbon Black

B.R.C. No. 20	lb.	.0105 / .0115
Bunarex 50, 75, 100, 115	lb.	.055 / .115
Calcene T	ton	40.00 / 50.00
Carbonex, flakes	lb.	.03 / .035
S Flakes	lb.	.0325 / .0375
Plastic	lb.	.031 / .0335
Clays		
Aerfloted Hi-White	ton	10.00
Paragon	ton	10.00
Suprex	ton	11.00 / 23.50
Aluminum flake	ton	15.50 / 25.50
Barden	ton	12.00
Buca	ton	40.00
Catalpo	ton	30.00
China	ton	9.00 / 16.00
Dixie	ton	13.00
Hydratex R	ton	22.00
Hydrowhite	ton	15.00
L.G.B.	ton	16.00
Paragon (R)	ton	11.00
Pigment No. 33	ton	30.00
Witco Nos. 1, 2	ton	25.00
Cumar EX	lb.	.0525
MH	lb.	.065 / .1175
V	lb.	.0975 / .1275
Darex Copolymer No. 3	lb.	.395 / .42
No. X 34	lb.	.45 / .475
G Resin	lb.	.08
Good-Rite Resin 50	lb.	.415 / .455
Kalvan	ton	100.00
Magnesia, Calcined		
Extra light, U.S.P.	lb.	.31 / .33
Light, technical	lb.	.28
No. 101	lb.	.175
Heavy, technical	lb.	.05 / .1275
Medium light, technical	lb.	.12
Magnesium carbonate	lb.	.0725 / .1175
Marbon S, S-1	lb.	.52 / .65
Type B	lb.	.65 / .75
Naftex EPC-80	lb.	.0825 / .1125
HMF-67	lb.	.065⅝ / .083⅝
-75	lb.	.07 / .09
MPC-80	lb.	.0825 / .1125
SRF-67	lb.	.055⅝ / .073⅝
-75	lb.	.057⅞ / .077⅞
Neville R Resins	lb.	.085 / .1375
Para Resins 2457, 2718	lb.	.04
Picco 75	lb.	.105
100	lb.	.105 / .155
Piccolyte Resins	lb.	.17 / .205
Piccoumaron Resins	lb.	.055 / .16
Piccovars	lb.	.0875 / .155
Resin C Pitch	lb.	.015 / .021

Resinex	lb.	$0.0275 / $0.0325
S-Polymers	lb.	.44
Silene EF	lb.	.055 / .06
Witcarb R	ton	100.00
R-12	ton	32.50
Zinc oxide, commercial	lb.	.10 / .12⅞

Retarders

Armeen HTD	lb.	.43 / .53
Cumar RH	lb.	.105
Delac J	lb.	.55 / .60
E-S-E-N	lb.	.34 / .39
M-B-T	lb.	.34 / .39
M-B-T-S	lb.	.39 / .44
R-17 Resin	lb.	.1075
Retarder W	lb.	.43
Retardex	lb.	.475
RM	lb.	1.25
Thionex	lb.	1.25
Thiuram E. M	lb.	1.25
Vultrol	lb.	.50 / .55

Solvents

Benzol, industrial	gal.	.19 / .26
Bondogen	lb.	.55 / .60
Carbon bisulfide	lb.	.055 / .085
Tetrachloride	lb.	.07 / .095
Cosol No. 1	gal.	.26 / .34
No. 2	gal.	.25 / .33
GVL	lb.	1.00
Nevsol	gal.	.185 / .25
Picco Solvents	gal.	.115 / .27
Skellysolve-B	gal.	.118
C	gal.	.11
R	gal.	.89
Tollac	gal.	.195 / .25
Toluol, industrial	gal.	.23 / .28
2-50-W Hi-Flash Solvent	gal.	.25 / .30
X-60 Solvent	gal.	.20 / .28
Xylol, industrial	gal.	.25 / .465

Synthetic Rubbers

Butaprene NF	lb.	.45 / .60
NL	lb.	.46 / .53
NXM	lb.	.50 / .65
Chemigum Latex Type 101 (solids weight)	lb.	.37 / .40
Chemigum N-1	lb.	53 / .60
Hycar Latex (dry weight)		
OR-15	lb.	.455 / .53
OR-25	lb.	.385 / .46
Hycar OR-15	lb.	.47 / .505
OR-25, OS-10	lb.	.40 / .435
Neoprene Latex (dry weight)		
Type 571	lb.	.25 / .30
572	lb.	.28 / .33
601-A	lb.	.31 / .36
700	lb	.30 / .35
842-A	lb.	.28 / .33
Neoprene Type AC	lb.	.50
GG	lb.	.50
E. M	lb.	.65
FR, KNR	lb.	.75
NC	lb.	.35

Paraplex X-100	lb.	$1.00
Perbunan 18	lb.	.39 / .425
26	lb.	.40 / .435
35	lb.	.47 / .505
Latex Type II (55%)	lb.	.38 / .42
Silastic		
Coating and laminating grades		
Nos. 120, 125	lb.	3.80 / 4.40
Molding and extrusion grades		
Nos. 150, 180	lb.	3.35 / 3.95
160, 167	lb.	2.90 / 3.50

Tackifiers

Bunarex 10, 25, 40	lb.	0.055 / 0.065
Hercolyn	lb.	.1122 / .1347
Koresin	lb.	.40 / .52
Nevillac	lb.	.17 / .19
Nevilloid C-55	lb.	.12
Nevindene	lb.	.105 / .135
Piccolastic Tackifiers	lb.	.20 / .205
Piccolyte Resins	lb.	.17 / .205
Piccoumaron Resin 427	lb.	.11 / .16
Resins	lb.	.0625 / .11
Staybelite Resin	lb.	.06 / .065
Synthetic 100	lb.	.41
Synthol	lb.	.225
Vistac No. 1	gal.	1.21 / 1.41
No. 2	gal.	1.61 / 1.75
Vistanex	lb.	.32 / .36

Vulcanizing Agents

Dibenzo G-M-F	lb.	1.50
Ethyl Selenac	lb.	1.60
Tuads	lb.	1.25
G-M-F	lb.	1.95
Litharge, commercial	lb.	.166 / .176
Eagle, sublimed	lb.	.17 / .176
FBS	lb.	.17 / .176
Magnesia, Calcined		
Extra-light, U.S.P.	lb.	.31 / .33
Carey	lb.	.28
Light, technical	lb.	.22 / .28
No. 101	lb.	.175
Heavy, technical	lb.	.05 / .31
Medium-light, technical	lb.	.175
Methyl Selenac	lb.	1.60
Tuads	lb.	1.25
Red lead, commercial	lb.	.176 / .19
Eagle	lb.	.18 / .185
#2 RM	lb.	.18 / .186
Sulfur flour, commercial	100 lbs.	1.90 / 2.85
Crystex	lb.	.32 / .45
Dichloride	lb.	.0325 / .0825
Insoluble 60	lb.	.16
Monochloride	lb.	.0325 / .0825
Rubbermakers	100 lbs.	1.50 / 2.00
Telloy	lb.	2.00
Vandex	lb.	2.00
Vultac Nos. 1, 2	lb.	.38 / .45
No. 3	lb.	.42 / .49
White lead silicate	lb.	.16 / .175
Eagle	lb.	.1685

Estimated Automotive Pneumatic Casings and Tube Shipments, Production, and Inventory—September, August, 1947; First Nine Months, 1947—1946

	1947				1946
Passenger Casings	September	% of Change from Preceding Month	August	First Nine Months	First Nine Months
Shipments					
Original equipment	1,674,632		1,413,914	14,281,030	7,080,426
Replacement	4,917,165		4,638,361	39,850,118	39,310,587
Export	132,823		122,381	1,222,075	418,228
Total	6,724,620	+ 8.91	6,174,656	55,353,223	46,809,241
Production	6,495,900	+11.61	5,820,172	57,420,758	47,525,755
Inventory end of month	3,705,594	— 5.10	3,904,743	3,705,594	2,586,035
Truck and Bus Casings					
Shipments					
Original equipment	453,260		378,803	4,160,825	2,860,665
Replacement	911,239		812,798	7,274,102	8,013,178
Export	156,486		153,992	1,269,584	589,119
Total	1,520,985	+13.03	1,345,593	12,704,511	11,462,962
Production	1,422,751	+ 5.82	1,344,558	13,472,991	11,468,675
Inventory end of month	1,485,236	— 4.76	1,559,531	1,485,236	785,684
Total Automotive Casings					
Shipments					
Original equipment	2,127,892		1,792,717	18,441,855	9,941,091
Replacement	5,828,404		5,451,159	47,124,220	47,323,765
Export	289,309		276,373	2,491,659	1,007,347
Total	8,245,605	+ 9.65	7,520,249	68,057,734	58,272,203
Production	7,918,651	+10.52	7,164,730	70,893,749	58,994,430
Inventory end of month	5,190,830	— 5.00	5,464,274	5,190,830	3,371,719
Passenger and Truck and Bus Tubes					
Shipments					
Original equipment	2,119,146		1,792,424	18,424,552	9,943,475
Replacement	4,930,109		4,509,409	36,468,076	41,623,460
Export	183,602		197,115	2,101,902	950,332
Total	7,232,857	+11.29	6,498,948	56,995,530	52,517,267
Production	6,549,844	+26.47	5,179,052	58,625,700	53,981,427
Inventory end of month	6,339,425	— 8.61	6,937,030	6,339,425	4,433,228

Note: Cumulative data on this report includes adjustments made in prior months.
Source: The Rubber Manufacturers Association, Inc.

Science and Living

(Continued from page 416)

and under normal conditions decisions would not have been made to make this type of equipment. The speaker also expressed his opinion that atomic power was a gift given to mankind for his ultimate good.

The group's next meeting will be held December 9 at the Hart House, University of Toronto. Roger Hatsch, of Polymer Corp., will speak on present-day conditions in Europe and his experiences while traveling on the Continent.

New Process for Insoluble Sulfur

A NEW process for the manufacture of insoluble sulfur has been developed by the research department of Stauffer Chemical Co., which is said to provide lower cost material to the rubber industry. Development of the new process has been under way for a number of years, and installation of the first unit should be completed before the end of the year. The first unit to use the new process is the company's eastern plant where it will supplement the original method used since 1934 and provide much needed additional capacity. The company also operates the older process at its plant on the Pacific Coast.

The company's insoluble sulfur, known as Crystex, is used as a vulcanizing agent for rubber. Crystex is elemental sulfur in a metastable, polymer form that is insoluble in most solvents for sulfur, including rubber, and therefore does not bloom on rubber surfaces. The material is used mainly in tire carcass stocks where it replaces all or part of the ordinary sulfur employed. The product was originally developed for use in tire repair stocks, such as camelback, where the insoluble property is essential to retain tack for prolonged periods awaiting application of the stock. Insoluble sulfur gives cleaner and brighter surfaces in white stocks than does ordinary sulfur and also improves the critical surfaces of some type of mechanical goods.

Also nearing completion is the development of an improved physical form of Crystex made possible by the new process. Working samples of the new product are being prepared by Stauffer for test and evaluation by the rubber industry.

Financial

(Continued from page 392)

Monsanto Chemical Co., St. Louis, Mo., and subsidiaries. Nine months ended September 30: net profit, $12,395,367, equal to $2.79 each on 4,231,497 common shares, contrasted with $6,987,663, or $1.63 each on 3,803,835 common shares, for the like period in 1946; sales, $105,829,063, against $69,212,831.

United Carbon Co., Charleston, W. Va., and subsidiaries. First nine months, 1947: net profit, $2,318,646, equal to $2.91 a share, contrasted wth $2,107,507, or $2.65 a share, in the comparable months last year.

Malayan Rubber Statistics

The following statistics for September, 1947, have been received from Singapore by way of Malaya House, 57 Trafalgar Square, London, W.C.2, England.

Ocean Shipments from Singapore and Malayan Union—In Tons

	Sheet and Crepe			Latex, Concentrated Latex, and Revertex (Dry Rubber Cement)		
		Malayan Union			Malayan Union	
To	Singapore Export Proper	Transhipped	Direct Shipments	Singapore Export Proper	Transhipped	Direct Shipments
Argentine Republic	3	33	..	21	..	..
Australia	2,281	277	..	2	32	..
Belgium	466	352	989	14	33	..
British India	..	..	25	..	..	..
Canada	1,320	150	1,124	..	..	..
Chile	55	..	..	..	..	..
China	781	..	183	..	..	..
Cuba	50	..	..	..	..	..
Cyprus	6	..	..	..	..	..
Czechoslovakia	55	..	3	..	..	..
Denmark	74	7	8	1	..	22
Eire	3	..	..	..	..	..
Egypt	1	..	..	..	..	..
Finland	30	..	..	..	..	..
France	926	534	1,785	..	102	..
Germany	400	65	1,404	38	..	..
Hong Kong	2,598	20	100	..	..	..
Italy	409	169	398	1	51	..
Japan	850	..	256	21	..	..
Mexico	..	..	190	..	..	..
Netherlands	125	165	175	27	36	..
New Zealand	208	7	..	..	9	..
Norway	75	..	177	..	..	..
Other countries in South America	2	1	..	..	..	..
Palestine	62	..	11	1	..	..
Portugal	..	..	50	..	..	..
Rumania	..	..	9	..	..	..
Russia	3,875	..	..	153	..	..
Spain	100	..	400	..	..	..
Sweden	126	55	115	..	..	..
Switzerland	175	..	5	..	..	..
Syria	4	..	..	..	..	..
Turkey	80	..	125	..	..	..
Union of South Africa	958	12	..	1	1	..
United Kingdom	4,124	1,825	6,715	1,035	28	86
U. S. A.	16,611	1,911	12,128	746	6	432
TOTAL	36,833	5,583	26,375	2,061	298	540

Foreign Imports of Rubber in Long Tons

	Dry Rubber	Wet Rubber (Dry Weight)
Singapore Imports from		
British Borneo	1,084	41
Brunei	196	3
Dutch Borneo	1,116	20
French Indo-China	....	230
Java	173	....
Other Dutch Islands	43	....
Rhio Residency	453	9
Sarawak	1,895	2
Siam	982	69
Sumatra	9,362	4,510
TOTAL	15,304	4,884
Malayan Union Imports from		
Burma	90	34
Siam	1,671	21
Sumatra	1,196	765
TOTAL	2,957	820

Dealers' Stocks

	Tons
Singapore	59,577
Penang & Province Wellesley	18,495
Up Country	41,196
TOTAL	119,268

Port Stocks in Private Lighters and Railway Godowns

Penang & Province Wellesley	11,642
Port Dickson	65
Port Swettenham	1,471
Singapore	9,041
Teluk Anson	390
TOTAL	22,609

Production

Estates	32,070
Small holdings (estimated)	21,412
TOTAL	53,482

United States Rubber Statistics, August, 1947

(All Figures in Long Tons, Dry Weight)

	New Supply			Distribution		Stocks, End
	Production	Imports	Total	Consumption	Exports	of Month
Natural rubber, total	0	42,888	42,888	45,816	191	123,020
Natural latex, total	0	1,784	1,784	1,473*	0	7,020
Natural rubber and natural latex: total	0	44,672	44,672	47,289	191	130,040
Synthetic rubber, total	31,649† 1,252‡	0	32,901	39,001	585	91,288
GR-S	26,443† 157‡	0	26,600	31,591	26	63,822§
Butyl	3,735†	0	3,735	4,481	0	17,500
Neoprene	1,471† 499‡	0	1,970	2,596	441¶	6,649
Nitrile types	596‡	0	596	333	118	3,317
Natural rubber and latex, and synthetic rubber: total	32,901	44,672	77,573	86,290	776	221,328
Reclaimed rubber, total	21,658	0	21,658	21,093	1,414	40,130
GRAND TOTALS	54,559	44,672	99,231	107,383	2,190	261,458

*Includes 120 tons coagulum declared scrap.
†Government plant production.
‡Private plant production.
§Includes 65 tons shipped for export, but not cleared.
¶Includes 300 tons applicable to April, 1947.

CLASSIFIED ADVERTISEMENTS

ALL CLASSIFIED ADVERTISING MUST BE PAID IN ADVANCE

Effective July 1, 1947

GENERAL RATES	SITUATIONS WANTED RATES	SITUATIONS OPEN RATES
Light face type $1.25 per line (ten words)	Light face type 40c per line (ten words)	Light face type $1.00 per line (ten words)
Bold face type $1.60 per line (eight words)	Bold face type 55c per line (eight words)	Bold face type $1.40 per line (eight words)
Allow nine words for keyed address.		*Replies forwarded without charge*

Address All Replies to New York Office at 386 Fourth Avenue, New York 16, N. Y.

SITUATIONS WANTED

CHEMIST. B.S. THOROUGHLY QUALIFIED FOR DEVELOPment work in adhesives. Experienced with outstanding industries, producing pressure-sensitive tapes of every type, cements, plastic coatings, laminants. My diligent and intensive work habits and close cooperation with department head should be of great value to any concern developing competitive products on rubber spreader and coating machine. Salary $90 per week. Address Box No. 993, care of INDIA RUBBER WORLD.

TECHNICAL SALES OR DEVELOPMENT. 1942 B.S., ENGINEERing background. Tire, tube manufacturing experience. Now directing diversified aircraft goods development. $5200. Address Box No. 994, care of INDIA RUBBER WORLD.

RUBBER CHEMIST: AGE 38, MARRIED, WITH 15 YEARS' experience in compounding, development, and production of sponge rubber and mechanical rubber goods with some experience in thermoplastics. Desires to make connection with responsible company in like position or technical sales. Address Box No. 995, care of INDIA RUBBER WORLD.

CALENDER ROOM SUPERINTENDENT WITH 20 YEARS' EXperience in rubber and vinyl resins seeks position with responsible firm. Address Box No. 996, care of INDIA RUBBER WORLD.

PLASTIC COATED FABRICS AND SIMULATED LEATHER: Chemist, age 34, B.S. in Chem. Eng. with 12 years' laboratory and plant supervisory experience in calendered and dispersion-type vinyl resins, polyvinyl butyral, vinyl and pyroxylin solution coatings, rubber and latex compounding for coated fabrics. Position desired in New England or vicinity. Address Box No. 997, care of INDIA RUBBER WORLD.

CHEMICAL ENGINEER, 37, MARRIED: 13 YEARS' EXPERIENCE in compounding, open mill and Banbury mixing, calendering, and tubing for hard rubber, sponge, and mechanicals; quality control, research and development, engineering, and plant operations in production of reclaimed rubber, synthetic rubber, latices, and dispersions. Location East. Available immediately. Address Box No. 998, care of INDIA RUBBER WORLD.

INDUSTRIAL ENGINEER

A PROMINENT RUBBER MANUFACTURING COMPANY IS SEEKING A TOP FLIGHT CHIEF INDUSTRIAL ENGINEER TO HEAD UP INDUSTRIAL ENGINEERING DEPARTMENT.

ESSENTIAL REQUIREMENTS: ENGINEERING GRADUATE: 30 TO 40; AN INTENSIFIED BACKGROUND IN METHODS, TIME STUDY, AND WAGE INCENTIVES IN RUBBER INDUSTRY; STRENGTH IN THE HANDLING OF UNION MATTERS AND GRIEVANCES; A SELF-STARTER WHO HANDLES PEOPLE WELL; A SOUND KNOWLEDGE OF COST ACCOUNTING AND COST REDUCTION PROGRAMS.

ALSO

TIRE DESIGN ENGINEER

SHOULD HAVE ALL-ROUND EXPERIENCE IN TIRE AND MOLD DESIGN AND RELATED PRODUCTION PROBLEMS. TO TAKE COMPLETE CHARGE OF TIRE DESIGN AND CONSTRUCTION DEPARTMENT.

REPLIES MUST BE EXPLICIT AND MUST LIST ALL PREVIOUS EMPLOYMENT AND EARNINGS.

ALL REPLIES TREATED STRICTLY CONFIDENTIAL.

REPLY TO BOX No. 983, Care of INDIA RUBBER WORLD.

SITUATIONS OPEN

ASSISTANT PRODUCTION MANAGER

Chemical plant in Philadelphia has an opening for a chemist or chemical engineer, age 35 to 40, with production experience to assist the production manager in quality control of compounded latices of natural or synthetic rubber and a variety of other textile chemicals. Must have had successful experience in supervising position. Experience in latex compounding and knowledge of statistical methods of quality control highly desirable, but not absolutely necessary. In reply give data on education, experience, professional reference, and expected salary.

Address Box No. 984, care of INDIA RUBBER WORLD

ENGINEER—AGE 25 TO 40, WITH SOME MECHANICAL GOODS production and engineering experience. This is an unusual opportunity in mechanical rubber products of a highly specialized nature. Extensive experience not absolutely necessary. Address Box No. 987, care of INDIA RUBBER WORLD.

WANTED: BY SMALL PROGRESSIVE MIDWEST MOLDED rubber goods plant operating over 30 years, a man to understudy Chief Engineer. Must be versed in compound building, mold design; knowledge of costing helpful. Excellent opportunity for right man, age 26 to 38. State full qualifications, references, wages, etc. Address Box No. 988, care of INDIA RUBBER WORLD.

SUPERVISING CHEMIST, NORTHERN NEW JERSEY, EXECUTIVE position, to manage rubber latex compounding in adhesive plant production, development, and sales promotion. Address Box No. 989, care of India RUBBER WORLD.

PROGRESSIVE SALES REPRESENTATIVE, MIDDLE ATLANTIC States, for new rubber latex and adhesive plant in Northern New Jersey. State experience. Address Box No. 990, care of India RUBBER WORLD.

OPENING AT TYER RUBBER COMPANY, ANDOVER MASS., for assistant sales manager on molded and extruded rubber products. Excellent opportunity for man experienced in this field.

SUPERINTENDENT, SPONGE RUBBER PLANT, MEDIUM SIZE. Must be 35 to 40 years of age. Experienced in sponge rubber or solid rubber. Must know complete operation of mill room, press room, and trimming room. Education must consist of high school and college education in engineering, either mechanical or chemical. Attractive proposition for suitable person. Address Box No. 992, care of INDIA RUBBER WORLD.

FACTORY MANAGER EXPERIENCED IN COMPOUNDING AND manufacture of mechanical goods, natural and synthetic rubber. Excellent opportunity. Address Box No. 4, care of India RUBBER WORLD.

DEVELOPMENT CHEMIST WITH SEVERAL YEARS' EXPERIENCE in rubber manufacturing for development work on synthetic rubber, cements and plastics for spreading, calendering and press curing. Excellent opportunity. Metropolitan New York area. Give complete résumé and minimum salary requirements in first letter. Address Box No. 5, care of INDIA RUBBER WORLD.

PROJECT ENGINEER WANTED FOR DEVELOPMENT WORK on friction materials. Must have experience in formulating and processing. Our employes are aware of this ad. Salary open. Address Box No. 7, care of INDIA RUBBER WORLD.

Where Needs Are Filled

The Classified Ad. Columns of INDIA RUBBER WORLD bring prompt results at low cost.

(Classified Advertisements Continued on Page 427)

Dominion of Canada Statistics

Imports of Crude and Manufactured Rubber

	September, 1947		September, 1946	
	Quantity	Value	Quantity	Value
Unmanufactured				
Crude rubber ....lbs.	2,416,115	$ 363,203	695,579	$ 152,058
Latex ....lbs.	184,293	51,923	64,609	17,990
Rubber, powdered and waste ....lbs.	93,100	3,899	1,164,500	28,435
Recovered ....lbs.	1,616,500	127,178	1,016,600	97,467
Synthetic and substitute ....lbs.	123,700	32,041	154,300	39,199
Totals.	4,433,708	$ 578,244	3,095,588	$ 335,149
Partly Manufactured				
Comb blanks of hard rubber	......	$ 1,008	......	$ ......
Hard rubber in rods or tubes ....lbs.	666	527	4,628	3,241
Rubber thread, not covered ....lbs.	6,179	7,661	5,200	9,055
Totals.	6,845	$ 9,196	9,828	$ 12,296
Manufactured				
Belting	......	$ 47,732	......	$ 32,045
Boots and shoes of rubber n.o.p. ....prs.	2,858	8,347	8,363	7,462
Canvas shoes with rubber soles ....prs.	1,982	5,407	683	1,382
Cement	......	55,777	......	37,486
Clothing of waterproofed cotton or rubber	......	4,859	......	1,298
Druggists' sundries	......	51,670	......	46,451
Gaskets and washers	......	25,986	......	19,062
Gloves ....doz. prs.	641	3,926	732	3,369
Golfballs ....doz.	362	1,966	712	4,168
Heels ....prs.	4,240	418	4,504	422
Hose	......	40,357	......	35,617
Hot water bottles	......	3,636	......	1,884
Inner tubes, n.o.p.....no.	3,182	7,306	10,536	47,197
Bicycles ....no.	2,666	1,429	2,100	1,119
Liquid sealing compound..	......	9,801	......	10,772
Mats and matting	......	59,143	......	48,299
Nursing nipples ....gross	288	1,076	1,095	3,312
Packing	......	10,766	......	10,035
Raincoats ....no.	226	658	1,940	5,823
Tires, pneumatic, n.o.p. no.	12,757	168,732	16,001	607,560
Bicycles ....no.	3,306	4,464	2,534	2,801
Solid for automobiles and motor trucks ...no.	27	785	67	2,370
Other	......	14,264	......	6,970
Tire repair material	......	10,935	......	60,920
Other rubber manufactures	......	328,970	......	236,253
Totals.	......	$ 868,410	......	$ 1,234,077
Total Rubber Imports.	......	$1,455,850	......	$ 1,581,522

Exports of Crude and Manufactured Rubber

Unmanufactured				
Crude rubber ....lbs.	1,584,325	$ 269,325	4,895,659	$ 910,214
Waste rubber ....lbs.	1,555,700	29,350	1,339,400	25,674
Totals.	3,140,025	$ 298,675	6,235,059	$ 935,888
Partly Manufactured				
Soling slabs of rubber.lbs.	......	$	13,390	$ 3,207
Manufactured				
Belting ....lbs.	241,658	$ 168,926	23,624	$ 12,512
Boots and shoes of rubber n.o.p. .....prs.	315,773	531,975	109,899	156,405
Canvas shoes with rubber soles ....prs.	199,674	171,599	168,682	151,527
Clothing of rubber and waterproofed clothing	......	23,530	......	14,840
Heels ....prs.	34,448	3,012	63,054	5,463
Hose	......	79,768	......	2,258
Inner tubes for motor vehicles ....no.	31,724	77,854	231	485
Soles ....prs.	19,054	2,096	9,835	1,679
Tires, pneumatic, for motor vehicles ...no.	44,677	736,806	651	25,076
Other ....no.	5,058	6,107	224	332
Wire and cable, copper, insulated	......	236,169	......	60,654
Other rubber manufactures	......	20,032	......	29,069
Totals.	......	$2,057,874	......	$ 450,300
Total Rubber Exports.	......	$2,356,549	......	$ 1,389,395

United States Motor Vehicle Factory Sales

(Number of Vehicles)

	Passenger Cars	Motor Trucks	Motor Coaches	Total
1946				
First nine months, total ...	1,329,345	615,028	6,532	3,321,474
1947				
January	246,605	99,818	1,273	347,696
February	267,015	105,042	1,303	373,360
March	301,525	118,234	1,421	421,180
April	314,765	106,984	1,650	423,399
May	284,357	96,430	1,853	382,640
June	307,124	91,620	1,628	400,372
July	279,631	97,755	1,806	379,192
August	261,158	86,486	1,765	349,409
September	307,942	110,720	1,608	420,270
First nine months, total....	2,570,122	913,089	14,307	3,497,518

Source: American Automobile Manufacturers Association.

Rims Approved and Branded by The Tire & Rim Association, Inc.

Rim Size	Oct., 1947
15" & 16" D. C. Passenger	
15x4.00E	16,871
16x4.00E	551,890
15x4.50E	5,553
16x4.50E	343,500
15x5.00E	55,159
16x5.00E	16,156
16x5.00F	16,492
15x5.50F	104,144
16x5.50	9,826
16x6.00F	2,504
16x4.00E—Hump	271,816
15x4.50E—Hump	52,957
16x4.50E—Hump	17,737
15x5.00F—Hump	6,076
15x5½-K—Hump	7,890
15x6-L—Hump	18,503
15x4½-K	44,051
15x5-K	253,265
16x5-K	189,506
15x5½-K	31,279
16x5½-K	35,431
15x6-L	29,110
16x6-L	101,450
15x6½-L	39,184
17" & Over Passenger	
18x4.00F	2,556
19x2.51B	2,120
Flat Base Truck	
20x3.75P	7,252
17x4.33R	3,607
20x4.33R	44,059
17x5.0	14,901
20x5.0	40,792
17x5.00R	1,674
20x5.00R	33,848
15x5.00S	2,552
20x5.00S	146,142
17x5.5	2,117
20x5.50S	12,418
15x6.0	520
20x6.0	121,276
20x6.00S	69,761
18x6.00T	3,277
20x6.00T	57,166
24x6.00T	441
15x6.5	1,038
20x6.5	275
20x7.0	4,866
20x7.00T	14,916
15x7.33V	757
20x7.33V	25,939
22x7.33V	15,171
24x7.33V	5,843
15x7.5	401
20x7.5	9,238
20x7.50V	4,835
22x7.50V	654
20x8.0	1,338
19x8.37V	1,228
20x8.37V	975
24x8.37V	1,886
20x10.0	303
Semi D. C. Truck	
15.5.50F	48,984
16x5.50F	24,732
Tractor & Implement	
12x2.50C	12,138
12x3.00D	44,570
15x3.00D	16,862
16x3.00D	8,380
18x3.00D	952
19x3.00D	12,331
21x3.00D	3,536
36x3.00D	3,979
40x3.00D	306
20x4.50E	7,500
36x4.50E	1,886
18x5.50F	8,618
24x5.50R	5,655
24x6.00S	1,918
36x6.00S	3,030
24x8.00T	3,097
28x8.00T	1,239
32x8.00T	854
36x8.00T	877
38x8.00T	15
W5-24	1,188
W7-24	179
W8-24	21,843
W8-38	310
W8-40	466
W9-24	1,778
W9-28	7,181
W9-36	1,038
W9-38	498
W9-40	292
W10-24	113
W10-28	13,702
W10-38	4,361
W11-26	1,520
DW8-36	71
DW9-38	6,974
DW10-38	9,370
DW11-28	2,862
DW11-30	598
DW11-32	2,605
DW11-36	1,023
DW11-38	17,158
DW12-26	2,509
DW12-30	1,307
DW16-26	28
Earth Mover	
20x11.25	121
24x11.25	155
24x13.00	677
32x13.00	65
24x15.00	95
25x15.00	335
25x17.00	10
29x17.00	261
33x19.50	11
Total	3,188,655

Trade Marks

(Continued from page 398)

433,356. **Firm-Kontrol.** Foundation garments, girdles, and brassieres. Even-Pul Foundations, Inc., New York, N. Y.

433,358. **Elliptic.** Corsets, girdles, etc. Dominion Corset Co., Ltd., Quebec, P. Q., Canada.

OUR NEW MACHINERY
HYDRAULIC PRESSES
CUTTERS—LAB. MILLS
BRAKES—LIFT TABLES
MILLS—MIXERS
SUSAN GRINDERS

NEW MACHINERY REBUILT

OUR 5-POINT REBUILDING PROCESS
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LOS ANGELES CALIFORNIA · AKRON OHIO · CHICAGO ILLINOIS · STOUGHTON MASSACHUSETTS

L. ALBERT & SON

COAST-TO-COAST
TRENTON, N. J.—MAIN OFFICE

CLASSIFIED ADVERTISEMENTS

Continued

MACHINERY AND SUPPLIES FOR SALE

FOR SALE: 1—WATSON-STILLMAN HYDRO-PNEUMATIC ACcumulator, low and high (3,000# pressure) with pumps and all accessories. 4—42" x 42", 8-opening, Hydraulic Presses with 24" rams, pumps, and motors. 1—48" x 48", 3-opening, Hydraulic Press with 4—10" rams, several other various sizes. 1—5' x 24' Vulcanizer with quick-opening door. 1 Royle #½ Tuber. Also Mills, Calenders, etc. Send us your inquiries. CONSOLIDATED PRODUCTS CO., INC., 13-16 Park Row, New York 7, N. Y. Telephone: BArclay 7-0600.

FOR SALE: TWO-ROLL RUBBER MILL. EQUIPPED WITH rolls 16-inch dia. x 42-inch length. Water cooled. Also have one 35 H.P.—1100 R.P.M.—220-volt—60 cycle motor for use with mill. Address Box No. 999, care of India RUBBER WORLD.

FOR SALE: THROPP 16" x 36" TWO-ROLL RUBBER MILL, also 40", 48", 60" & 84" sizes; Rubber Calenders 30", 54", 60"; Rubber Tubers & Extruders 2½" to 6"; Large stock Hydraulic Presses from 12" x 12" to 42" x 48" platens, from 50 to 500 tons; Hydraulic Pumps & Accumulators; H.P.M. Injection Molding Machine 2 to 4 ozs., other sizes up to 9 ozs. Stokes & Colton Single Punch & Rotary Preform Tablet Machines ½" to 2". Baker Perkins Jacketed Mixers 9, 20, 50 & 100 gals.; Kettles; Tanks; Grinders & Cutters; Mixers; Pumps; etc.

WE BUY YOUR SURPLUS MACHINERY
STEIN EQUIPMENT CO.
90 WEST STREET, NEW YORK 6, N. Y.

FOR SALE: 40,000 lbs. Poly Butene 240.

Send inquiries to
Box No. 986, Care of INDIA RUBBER WORLD

An International Standard of Measurement for

Hardness • Elasticity
Plasticity of Rubber, etc.

Is the DUROMETER and ELASTOMETER (23rd year)

These are all factors vital in the selection of raw material and the control of your processes to attain the required modern Standards of Quality in the Finished Product. Universally adopted.

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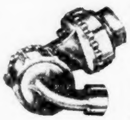
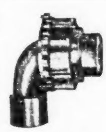


STYLE "H"

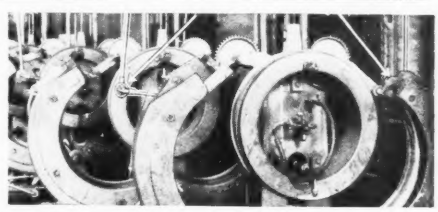
FOR FLEXIBILITY WITH DEPENDABILITY

FLEXO JOINTS

In any moving feed line Flexo Joints are the standard of the industry for dependability and constant service. Simply and ruggedly constructed with full protection from grit and dirt, they work smoothly and freely with no binding or restriction in any position.



STYLE "B"



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GUARANTEED REBUILT MACHINERY

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MILLS, CALENDERS, TUBERS
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HYD. PRESSES, PUMPS, MIXERS
CUTTING MACHINES, PULVERIZERS

UNITED RUBBER MACHINERY EXCHANGE

319-323 FRELINGHUYSEN AVE. CABLE "URME" NEWARK, N. J

(Classified Advertisements Continued on Page 429)

United States Imports, Exports, Reexports, Crude and Manufactured Rubber

Imports for Consumption of Crude and Manufactured Rubber

	March, 1947		April, 1947	
	Quantity	Value	Quantity	Value
UNMANUFACTURED, Lbs.				
Crude rubber	78,686,944	$19,421,550	101,813,788	$23,627,600
Rubber latex	1,112,025	324,103	76,800	26,754
Guayule	1,037,600	246,573	1,174,400	282,941
Balata	307,814	158,530	189,439	106,783
Jelutong or Pontianak	425,471	112,132	397,739	86,923
Gutta percha	47,200	28,898	69,618	48,178
Reclaimed rubber ...	40,206	3,247	......	......
Scrap rubber	886,126	19,758	474,214	10,542
TOTALS	82,543,386	$20,314,791	104,195,998	$24,189,721
MANUFACTURED				
Tires: auto, bus, and truck ....no.	458	9,509	919	30,663
Bicycle ....no.	110	110	5,657	9,126
Other ....no.	2,500	1,512	......	......
Inner tubes .....no.	5,171	16,621	3,418	12,824
Rubber boots, shoes, and overshoes ..prs.	554	783	......	......
Rubber-soled footwear with fabric uppers ....prs.	160,009	187,473	30,536	37,579
Rubber heels and soles .....doz. prs.	......	......	10,888	1,500
Athletic balls: golf ..	3,600	1,000	14,600	5,709
Lawn tennis	756	142	2,500	924
Other	4,752	2,359	60	49
Hard rubber products	35	569	......	34
Rubberized printing blankets	......	......	1,075	5,022
Rubber and cotton packing ....lbs.	10,044	13,315	1,419	1,881
Rubber gaskets and valve packing ..lbs.	.....	46	......	257
Rubber belting ..lbs.	......	......	750	673
Rubber hose and tubing ....lbs.	......	41	......	55
Soft rubber: druggists' sundries	......	259	......	......
Other products ...	.....	30,446	......	4,953
Rubber substitute products	......	......	7,477	1,289
TOTALS	187,990	$264,185	79,249	$112,538
GRAND TOTALS, ALL RUBBER IMPORTS ..	82,731,376	$20,578,976	104,275,247	$24,302,259

Reexports of Foreign Merchandise

	March, 1947		April, 1947	
	Quantity	Value	Quantity	Value
UNMANUFACTURED, Lbs.				
Crude rubber	86,406	$23,592	58,885	$20,725
Balata	222,889	153,279	123,371	72,499
Chicle	......	......	2,000	1,210
TOTALS	308,295	$176,871	184,256	$94,434
MANUFACTURED				
Tire casings and tubes ....no.	2,887	$372	16	$62
Rubber and balata belting ....lbs.	1,415	1,433	......	......
Rubber hose and tubing ....lbs.	79	65	92	74
Rubber and friction tape ....lbs.	146	125	......	......
Rubber packing ..lbs.	1,142	1,711	......	......
Hard rubber products	72	110	......	......
Druggists' sundries..	......	327	......	1,234
Other rubber products	......	1,090	......	558
TOTALS	5,741	$5,233	108	$1,928
GRAND TOTALS, ALL RUBBER REEXPORTS	314,036	$182,104	184,364	$96,362

Source: Bureau of Census, United States Department of Commerce.

Exports of Domestic Merchandise

	March, 1947		April, 1947	
	Quantity	Value	Quantity	Value
UNMANUFACTURED, Lbs.				
Balata	1,400	$4,480	1,000	$2,980
Synthetic rubber:				
GR-S	1,155,563	234,696	223,743	44,652
Butyl	766	193	......	......
Neoprene	267,928	87,598	1,160,331	351,753
Nitrile	151,925	77,660	87,264	38,480
"Thiokol"	400	180	1,500	1,254
Polyisobutylene ..	13,969	4,456	5,420	1,772
Others	520	2,139	12,285	7,218
Reclaimed rubber ...	2,840,312	225,732	2,403,313	187,842
Scrap rubber	5,511,372	216,502	4,079,977	165,592
TOTALS	9,944,055	$853,636	7,974,833	$801,543
MANUFACTURED				
Rubber cement..gals.	53,947	$82,495	107,952	$123,761
Rubberized fabric: auto cloth sq. yds.	81,341	38,904	58,676	43,422
Piece goods and hospital sheeting ....sq. yds.	200,504	161,471	309,311	224,303
Rubber footwear: boots ....prs.	47,195	177,607	45,360	142,259
Shoes ....prs.	112,416	200,615	52,196	80,187
Rubber soled with fabric uppers prs.	141,777	210,428	164,458	229,468
Soles ....doz. prs.	25,627	89,540	12,430	41,512
Heels ......doz. prs.	128,992	109,221	86,779	92,092
Rubber soling and top lift sheets ....lbs.	147,954	40,324	176,297	36,331
Rubber gloves and mittens ...doz. prs.	37,042	103,587	29,856	82,074
Druggists' sundries: water bottles and fountain syringes ....no.	80,138	51,279	115,269	67,538
Other	......	344,116	......	340,234
Rubber and rubberized clothing	......	393,521	......	221,698
Balloons	......	190,745	......	188,752
Rubber toys and balls	......	67,982	......	59,344
Bathing caps ...doz.	5,514	25,348	7,737	35,714
Rubber bands ...lbs.	32,687	23,508	25,984	19,712
Erasers ....lbs.	73,769	71,951	55,345	57,295
Hard rubber goods: battery boxes.no.	62,338	45,546	45,290	44,502
Other electrical goods ......lbs.	148,548	66,452	128,219	49,206
Combs ....doz.	2,734	2,852	17,777	12,418
Other	......	8,570	......	34,865
Tire casings: truck and bus .....no.	171,383	6,808,868	191,998	7,577,964
Auto ....no.	166,189	2,156,770	198,735	2,318,227
Inner tubes: auto, truck, and bus no.	273,534	968,494	305,145	1,070,891
Other casings and inner tubes ...no.	119,064	1,176,201	123,566	1,072,874
Solid tires: auto and truck ...no.	8,368	250,636	19,621	466,879
Other	16,912	7,499	62,449	17,556
Tire repair materials: camelback ..lbs.	1,146,192	284,637	1,264,185	294,406
Other ....lbs.	546,603	296,565	842,428	335,923
Rubber and friction tape ....lbs.	192,951	97,164	116,728	65,954
Rubber belting: auto fan belts ....lbs.	238,121	237,033	232,009	243,628
Other ....lbs.	1,589,148	1,465,869	2,017,128	1,720,725
Hose and tubing: garden hose..lbs.	40,984	16,173	68,018	36,141
Other ....lbs.	1,061,071	703,539	1,252,886	872,568
Rubber packing ..lbs.	245,734	162,198	213,672	148,928
Rubber mats, flooring, and tiling.lbs.	489,208	127,968	644,046	196,003
Rubber thread: bare ....lbs.	101,274	132,528	73,476	97,217
Textile covered.lbs.	15,297	39,202	7,022	21,320
Gutta percha manufactures ......lbs.	4,091	6,149	17,041	13,406
Compounded latex and other rubber for further manufacture ....lbs.	339,219	171,530	244,190	97,165
Other rubber products	......	344,292	......	324,142
TOTALS	8,147,866	$17,959,377	9,333,261	$18,145,740
GRAND TOTALS, ALL RUBBER EXPORTS ..	18,141,921	$18,812,013	17,308,094	$18,947,283

Contributions of Organic Chemistry

Continued from page 359)

(31) Kharasch, Fuchs, private communication, University of Chicago to ORR, May 10, 1945.
32) Kharasch, Westheimer, private communication, University of Chicago to ORR, December 6, 1943.
(33) Kolthoff, Dale, private communication, University of Minnesota to ORR, May 23, 1944.
May, Kolthoff, private communication, University of Minnesota to ORR, August 30, 1944.
(34) Kharasch, Westheimer, private communication, University of Chicago to ORR, September 13, 1943.
(35) Briggs, Bishop, Myles, private communication, Bell Telephone Laboratories to ORR, June 24, 1943.
Snyder, Stewart, Ziegler, Myers, private communication, University of Illinois to ORR, August 8, 1945.
(36) Cotten, Wicklatz, Reynolds, private communication, University of Cincinnati to ORR, January, 1945.
Reynolds, private communication, University of Cincinnati to ORR, August 22, 1944.
(37) Cotten, Reynolds, private communication, University of Cincinnati to ORR, April 25, 1946.

(To be continued)

Correction

On page 637 of our August, 1947, issue, in the Article, "Development of Methods of Chemical Analysis of Synthetic Rubber" by Williard P. Tyler and T. Higuchi, there appeared a formula for the relation between bound styrene content and refractive index which was incorrectly printed. The correct formula is:

$$\%\ \text{Styrene}\ 22.94 + 0.118(n_D - 1.5339) \times 10^4 - 2340(n_D - 1.5339)^2$$

Also, on page 636, in the second column, the first sentence in the first paragraph should read "GR-S black masterbatches are *now* standard production items." "Now" was originally printed as "not."

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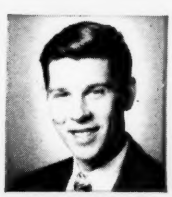
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